SCIENCE.

FRIDAY, FEBRUARY 22, 1884.

COMMENT AND CRITICISM.

It was an old theory, taught in text-books of philosophy, that the conclusions of mathematics were absolutely certain, — quite exempt, in fact, from that liability to error which so troubles our conclusions on other subjects. Yet disagreements among mathematicians upon the demonstrable results of their science, even if rare, are not wholly unknown. A remarkable case of this sort is now seen in a discussion which has been going on since last summer in the Royal astronomical society of London. Mr. E. J. Stone, president of the society, and director of the Radcliffe observatory at Oxford, informed the society that he had detected a serious error in the astronomical measurement of time, arising from the substitution of Le Verrier's tables of the sun in the *British nautical almanac* in 1864 in place of the old ones. To this cause, he claimed, were due certain extraordinary errors in the tables of the moon, which had perplexed astronomers for the past ten years. At the same time he communicated to the Royal society an extended memoir, in which he gave several elaborate demonstrations of his views.

These papers no sooner appeared than the new theory became the object of attack on all sides. Such astronomers as Airy, Adams, Cayley, and Christie, in England, as well as their French neighbors, published elaborate refutations, showing that Mr. Stone was wholly mistaken. His carefully prepared memoir was refused admission to the Philosophical transactions. If mere numbers or authority could have settled the question, Mr. Stone would have been crushed; but he has so far maintained his ground against his numerous opponents with a perseverance which we cannot but admire, how little soever we may share his views. After going on for eight months, the discussion seems to be as lively as ever. Its most curious feature is, that the questions involved are purely mathematical. The new tables of the sun make the year shorter than the old ones by about one and a half seconds. Mr. Stone claims that the unit of time is changed by this same amount; that is, that we are using a new measure of time, which is gaining on the old one at the rate of three seconds every two years, so that it has gone ahead thirty seconds since 1864. His opponents claim that this is absurd, since it is not the year, but the day, which is taken as the fundamental unit; and the change in the length of the day is totally inappreciable. As yet, the dispute shows no signs of approaching its end.

It is stated that the outlines of the plan for the Greely relief expedition, approved by the Navy department, are practically as follows: the relief party to go north in two vessels, reaching Upernavik not later than May 15; thence to Littleton Island, endeavoring to open communication with the Eskimos at Cape York. A depot with one year's supplies, coal, clothing, boats, and a steam-launch, should be established at Littleton Island by the first ship, and left in charge of an officer and two men. This vessel would then approach the borders of the pack, and push northward at the first favorable opportunity; the second vessel to cruise about the edge of the ice, and hold herself in readiness to establish another depot on shore in case the first vessel be lost, and the second required to proceed northward in her place. Should Smith Sound be comparatively open, the first vessel will proceed to form secondary depots at or near Washington Irving Island, Cape Collinson, and Carl Ritter Bay; the second, after making a depot at Cape Sabine, to proceed north not farther than Dobbin Bay, unless required by disaster to the first vessel.

In the latter case, before proceeding farther, the second vessel is to land her house, two boats, and a year's supplies for the whole party, in the vicinity of Dobbin Bay. Should both vessels avoid disaster, yet not succeed in communicating with Greely, one is to winter in Franklin Pierce Bay, and the other near Littleton Island. The coast is to be examined on the way north, and cairns enclosing notices of the relief party's plans established at prominent points on both coasts. The naval vessel or tender is to go as far as Littleton Island or Cape Sabine. Whalers and sealers are to be asked to keep watch of the ice-floes for any drifting party. It is also suggested that an advance ship be sent up still earlier, if possible, to relieve the Greely party, if by any chance they should have reached the Danish settlements or the entrance of Smith Sound. It is stated that Commander W. S. Schley, U.S. N., has been selected to take charge of the expedition.

In many respects this plan seems well considered, and, in proper hands, likely to succeed in the desired object. It may be doubted, however, if the projectors fully realize the inadvisability of too great haste in attempting to proceed northward of Littleton Island, or the strong probability that no satisfactory opportunity for northward progress will occur in the natural course of things much before the end of July. Nothing would be easier than to grind up two or twenty of the strongest ships by pushing them into the pack too early. On the other hand, a proper method of early relief preceding the time of navigation — namely, by small coastwise boat and sledge parties combined — does not seem to have received any consideration in the report. Such parties would be much more likely to get early information than any number of vessels entangled in the floes off shore. It is certain, from all previous experience, that the chances are greatly in favor of finding the party on the western shore rather than on the Greenland coast. The probability of their having been able to reach Littleton Island is infinitesimal. We hope, that, in addition to the government expedition, a large reward will at once be offered to any one who may succeed in rescuing the party. This would enable private parties to make their preparations for such an attempt before all the whalers and sealers have left port, would greatly increase the chances of a rescue, and would put all parties on their mettle. To neglect this precaution would be almost criminal.

The destruction of the forests is frequently assigned as an efficient cause of freshets. But all the primeval forests which covered the head waters of the Ohio did not prevent freshets, nor could they under certain combinations of circumstances. A wide-spread storm, with heavy rain on frozen ground and snow, such as to raise all its tributaries at once, must inevitably cause a flood. The floods of early days were of longer duration than those of to-day, by reason of the forests standing upon the river-bottoms and adjacent banks, which became filled with matted drift-wood, forming a tangled mass which obstructed rapid flow, and through which the water found its way but slowly. The most serious effect of the denudation of the land is the increased erosion to which it is exposed, by which the fertile soil, unprotected by vegetation, is swept by the rains into the rivers, and lost. The magnitude of this loss, and the great erosive effect of water on the clay soil of the west, can only be realized by those who have observed the tawny floods, thick with mud, which flow through the deep and wide valleys which the western rivers have cut in the soft earth.

In bright lands like Australia, where sunshine is sometimes so prevalent as to give rise to complaint, it would seem that the advent of the rain-doctor should cause no alarm. Mr. Russell, the government astronomer of New South Wales, has, however, gone a long way toward discouraging the endeavors of this well-minded individual, notwithstanding his offer to work reasonably, as it will appear to some, with nitroglycerine, with cannon, with elec-

trical machines, with kites, etc. But Mr. Russell predicts his speedy loss of position in the modern social scale, if, having no correct understanding of cause and effect, he pretends to pull down the clouds with a wire, or frighten them with a few crackers. In this habit of belief, apparently so thoroughly ingrained in human nature, that a comparatively slight artificial commotion in the atmosphere is enough either to bring rain out of a clear sky, or to superinduce a calm in violent storms, there is, it must be confessed, something akin to the popular conception of homoeopathy. But in countries other than Australia it may be possible that the necessary condition of unstable equilibrium is more frequently attained, when artificial rain might be a matter of easy production. For Australia, however, there can be little doubt that Mr. Russell is in the right; and when, as he remarks, so many proposals are put forward, some even going so far as to propose that his government should take to cannonading the sky, it is time that some one took the matter up.

THE Philadelphia papers are vigorously discussing Dr. Harrison's plan for a biological institute in that city, and the outlook for it appears favorable. The only exception that has been taken to the plan has been doubt as to the desirability of creating an independent institution, when the work might better be intrusted to the already existing academy or university. This is comparatively unimportant: what is essential is a separate and ample endowment in safe hands. Yet it must be said, that neither of those establishments carries on its work primarily for the training of *investigators*, which is the special aim of the proposed institute; and such an institute Philadelphia absolutely requires, if it would not lose the position it has long held in American science. The academy certainly has neither room nor funds for the purpose; and being at this moment before the public, asking for a large sum of money for building-purposes, only to carry out more fully work in which it has long been engaged, it would be hampered rather than aided by the partial endowment which would probably result for either purpose.

THE legislatures of Virginia and Maryland, stirred by the approaching failure of the oyster-crop, are moving for protection for the beds in apparent good faith. Something will doubtless be done; but the devastation has gone so far, that no immediate improvement can reasonably be expected.

RETURNING to the question of the use of copper as a prophylactic in cholera cases, so much discussed during the recent Egyptian epidemic, Mr. Vulpian presented a note to the French academy, at a recent meeting, written by Mr. Axel Lamm of Stockholm. Mr. Lamm states, that it is a fact that the workers in the copper-mines of Fahlun, in Dalecarlia, did escape during the epidemic of 1834. Judging by this, plaques of copper were tried as a remedy, placed on the stomachs of the patients in the cholera hospitals. The only result was the formation of verdigris if the plaques were not properly cleaned, and consequent ulceration from its caustic action. Fahlun has escaped five or six times, however, when Stockholm has not; and Mr. Axel Lamm suggests the possibility of the great amount of sulphuric-acid gas in the air being the reason, but he has not as yet made any further investigations.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

Macrospores in the rocks about Chicago.

SINCE submitting the committee's report on this subject (see p. 237) to the Chicago academy of science, I have continued the investigation of drift material in this vicinity, and from other parts of the northwest. So far as examined, all of the clays on the west shore of Lake Michigan, from Kenosha, Wis., on the north, to the Indiana state line on the south, contain an abundance of the disks, or macrospores, referred to in that paper, both free in the clay and *in situ* in fragments of shale. These clays range from some seventy feet above the level of Lake Michigan to (I am advised) over two hundred feet below its surface.

In the examination of clays from other localities, I get some very unexpected results. In several specimens of 'blue bowlder clay' kindly sent to me by Prof. N. H. Winchell, state geologist of Minnesota, and "taken from fourteen to twenty-one feet below the surface, when digging a well at Litchfield, Meeker

county, Minn.," I find an abundance of macrospores, besides several species of fossil rhizopods, fragments of Diatomaceae, and other organic remains, and several species of well-preserved and characteristic Foraminifera, — among others, Textularia globosa and Rotalia globosa as identified by Professor Joseph Leidy, who advises me that these forms are yet living and common in the Atlantic Ocean. A disk form with crenate margin, much resembling the lorica of an infusorian, is quite abundant, and large quantities of forms and fragments not yet identified. I presume that these fossils are mostly derived from the cretaceous formations, of which the Minnesota clays contain large amounts.

From careful observation and comparison, and the great similarity of much of the contents of the Minnesota clays with what I find associated with the macrospores found here, I am confident that I shall yet find in the Minnesota clays, mingled with the Foraminifera, etc., of the cretaceous formation, the shale and macrospores of the Devonian.

All of the fossils yet identified in the Chicago or Minnesota clays are undoubtedly of marine origin.

B. W. THOMAS.

Chicago, Feb. 11.

Rare Vermont birds.

The work of collecting material for a list of Vermont birds has revealed some notes of particular interest to ornithological students. Quite a number of rare or hitherto unobserved species have been found to be regular summer visitors in certain localities.

The orange-crowned warbler (Helminthophaga celata Say, Bd.), a rare straggler to New England, has been detected breeding in small numbers at Island Lake, Mount Killington, and at Lake Bomoseen in Castleton. In the latter locality, also, the blackpoll warbler (Dendroeca striata Fonst.) is a common summer resident. A specimen of the rare Connecticut warbler (Oporornis agilis Wils., Bd.) was taken at Rutland, April 24, 1879. This is probably the first published record north of Massachusetts. At Burlington I noted several flocks of the Bohemian waxwing (Ampelis garrulus L.), Nov. 25, 1882, and Jan. 21, 1883.

The loggerhead shrike (Lanius Ludovicianus L.) is a regular resident in certain districts in summer. Several nests have been found at Brandon, Rutland, and elsewhere.

White-winged crossbills (Loxia leucoptera Gm.) come frequently in winter, and some are known to breed. The discovery of two nests with young, at Lunenburg, March 22, 1878, by Mr. W. E. Balch, is notable.

The pine linnet or American siskin (Chrysomitris pinus Wils., Bp.) was found nesting at Rutland, May 15, 1879; and Mr. D. C. Worcester discovered two of their nests at Hartland. One was built in a pine in his yard, and commenced in March: the other was in a spruce, and contained young birds by the first week in April.

The black-backed three-toed woodpecker (Picoides arcticus Sw., Gr.), known generally as a casual winter visitor to New England, was found in the capacity of a resident at Lunenburg, where the nests were taken June 1, 1880, and May 29, 1882.

A nest of the American avocet (Recurvirostra americana Gm.) was recorded at Rutland in the spring of 1882; and the Florida gallinule (Gallinula galeata Licht, Bp.), of southern extraction, breeds at Castleton, where several of the birds have been secured. A specimen of the common cormorant (Phalacrocorax carbo L., Leach) was shot on Lake Champlain, and is now in possession of Mr. Jenness Richardson of Rutland, upon whose valuable observations many of these notes are based.

Of the sooty tern (Sterna fuliginosa Gm.), another rare straggler from the south, two specimens have been recently taken in Vermont, — at Rutland and Larrabee's Point, Lake Champlain. Of the still rarer short-tailed tern (Hydrochelidon lariformis L., Coues), Mr. Richardson saw three individuals on Lake Bomoseen, Castleton, one of which he secured.

The sea-dove or dovekie (Alle nigricans Sink), a winter waif from the arctic regions, has been known to occur but once in the state. This was at Sharon, where it was found one morning in the autumn in a gentleman's porch.

Several other birds might be mentioned whose presence here, or in the New-England States, is casual and infrequent. About two hundred species have thus far been noticed within the borders of the state, and it is likely that future observations will largely increase the number.

FRANCIS H. HERRICK.

The red skies in the Pacific.

Only last week I learned from Hon. H. M. Whitney, postmaster-general, that on Sept. 5, Mrs. Whitney and himself distinctly observed the sun's disk, before setting, to be green. His residence is an exception to most of ours in Honolulu, from which trees cut off the view of the horizon. My wife spoke much that night of a strange green cumulus, seen by her ten minutes before calling me to observe the portentous masses of color pouring out all over the sky.

I beg special attention to my remark in the *Hawaiian annual* upon the 'earth's shadow sharply cutting off' the upper rim of the first-glow:—

"One marvellous effect is often a sudden appearance of thick luminous haze where a minute before all was pellucid, unsullied blue. Meantime the glow especially gathers and deepens above the western horizon along a line of 60 degrees until the whole occident is a uniform sheet of flaming crimson, shading up into lilac and orange. Down upon that creeps the dark earth-shadow, sharply cutting off the edge of the blazing sheet, often serrated with the shadows of remote cumuli. As the shadow descends, the glow deepens, until night has closed down upon it. At once on the darkened sky arises a secondary or 'after'-glow, repeating the same phenomena as the stars come out with almost equal brilliancy of effect. In this after-glow the defined shadow-line is lacking, and the deep fiery red above the horizon bears a singular resemblance to the peculiar reflection on the sky of some immense but remote conflagration. These appearances occur before sunrise with equal brilliancy, but in reversed order."

This effect was very manifest in the strong, heavy glows of September, showing clearly that the first glow reflected the sun's direct rays, while in the after-glow, which had no defined upper rim, but continued much longer, the haze reflects only the light of the first-glow. This bears upon estimates of the height of the haze.

Observers here are well agreed that during November there was a very great abatement of the glows, amounting almost to a cessation, although the whitish corona was always well developed through the day. Early in December the glows were renewed, and for six weeks continued with much uniformity, and quite as brilliant as in October. They are now somewhat abated, although quite uniform nightly. In September and October they were extremely unequal, as well as varying in position of greatest color north or south of west.

The bark C. Southard Hurlburt observed the glow on Sept. 3. She was dismasted in a cyclone, Aug. 18, and came to Honolulu for repairs. On the former

date she was in about latitude 17° north, longitude 125° west. The captain's wife, Mrs. Davis, described the phenomena to me as extremely brilliant.

S. E. BISHOP.

Honolulu, Jan. 30.

The Philadelphia biological institute.

The proposition of Professor Allen of the University of Pennsylvania for the establishment of an institution for the education of both sexes in biological science, is one that he, and many others like minded, have long hoped to see established in Philadelphia. Indeed, it was somewhat expected, when the large building-fund that enabled the Academy of natural sciences to put up its present elegant quarters was asked for, and generously subscribed to principally by the manufacturers of Philadelphia, that something of the kind Professor Allen asks for would be the result. The writer was principal of the school of design for women at the time the successful effort was being made for a new building for the academy; and well does he remember the promises that were then made as temptations to contributors. It may be that 'the representative members of the academy' think that the quite limited extent of the 'educational' plans that they have been pursuing is a fulfilment of the promises then made; and perhaps they are, as they understood it at the time. Yet do I feel quite certain, that if the gentlemen who so generously helped the academy then, and before that time, also were told that the controlling parties of the academy were to refuse to put the building and what there is therein to the use of extended scientific education, it would be to most of them, if not to all, a surprise. I do not mean to say that the academy people have refused to do so; but it looks, from your 'Comment and criticism,' as if something of that kind had been done. My long and intimate experience with 'representative members' of public educational institutions has impressed my mind strongly with the idea that those gentlemen fail to draw distinction enough between themselves and the schools they represent; and, being placed there to manage and direct, they too often seek to carry out *their own ways*, rather than consider broadly the full purpose, scope, and public usefulness, of the institutions under their care, which should ever be rule, amongst evolutionists at least.

The Academy of natural sciences in Philadelphia would be a grand central body, magnificently prepared as a starting-point for biological education; and it would be a pity indeed, if the generous citizens of my old city should be put to the expense of another distinct building, and its professors to the trouble and expense of getting together another collection, perhaps to be placed within a few hundred yards or feet of the present academy. Would it not be more than a mere pity?

T. W. BRAIDWOOD.

Cassiterite from King's Mountain, North Carolina.

Mr. Robert Claywell, a student at the high school at King's Mountain station, on the line between Cleveland and Gaston counties, found in the street of the village a piece of mineral, which he sent me for determination. The mineral turned out to be massive cassiterite, the first found in this state. Ascertaining that there was a considerable amount of it scattered through the surface-soil there, I visited the locality, and instituted some explorations.

My expectations were more than verified when I found pieces of cassiterite from the size of an egg to the finest sand, loose and sticking in quartz, scattered over the surface in a belt beginning about the centre of the village, and extending southward a mile or more. Several shafts were sunk, and trenches dug, which finally exposed a main vein and several smaller veins of quartz and quartzite, bearing the tinstone. The veins are nearly vertical; direction of outcrop, north-east with the rocks of the country. The wall-rock is a mica schist, which is broken down from both sides of the vein at places farther than has been dug. The chief accompanying minerals are tourmaline, titanic iron, mica, and, less abundant, zirkon and rutile. At points the tinstone is disseminated abundantly through the vein-rock: at other points little is found. It is mostly in small grains mingled with the other minerals, tourmaline chiefly. Changes of temperature have broken it out of the surface-rock; and washing the soil yields a black sand, which is composed of the dark-colored minerals mentioned.

The cassiterite is mostly massive or semi-crystallized. I have noticed the forms P, P∞, ∞P, and ∞P∞ in only a few specimens. Hardness, 6.5 to 7; specific gravity, 6.6 to 6.9; color, generally dark brown, but varying from black to almost colorless; composition, mostly an impure cassiterite, with 50 % to 60 % of tin, some specimens running as low as 46 %, others, light-colored ones, as high as 74.4 %. The other ingredients are silica and oxide of iron. So far, I have not detected any sulphur or arsenic.

According to Dr. Emmons, the village of King's Mountain is near the dividing-line between the Laurentian granite and the Huronian slates. To the east of the village the rocks are micaceous and slaty quartzites, talcose slates, and bluish crystalline limestone. A few miles west are the hornblende slates, gneiss, etc.

The only remark on tin which I find in writings on North Carolina mineralogy is the following from Dr. Genth ('Mineralogy of North Carolina'): "No tin ore has been found in North Carolina as yet; traces of this metal have been found in the tungstates of Cabarrus county, *and in a micaceous slate* (Huronian) *in Gaston county*, associated with garnet and columnar topaz" (the Italics and parenthesis are mine). The observation is very interesting in the light of the recent discoveries. Have we not here at King's Mountain, at or near the juncture of these slates and the older gneiss and granite, a concentration of this diffused tin?

CHARLES W. DABNEY, jun.

N.C. experiment-station, Feb 14, 1884.

Behavior of Dolomedes tenebrosus.

Last August I obtained a large female specimen of Dolomedes tenebrosus. It measured over four inches from the tips of the first pair of legs to the fourth pair. It was taken in a swamp, and confined in a tin can, where it remained a day or two before it came into my possession. Upon opening the can, I found it apparently half dead with fright. It had deposited its eggs without attempting to make a cocoon. The appearance of the eggs indicated that it had extruded them prematurely. They were mixed with an abundance of mucilaginous substance, which soon hardened, and held the eggs firmly together and fast to the can. I now put it in a cage, where it soon recovered from its fright. The cage was two by three feet, the top covered with glass, and the bottom uncovered, so that it might have the fresh earth and plants to run among.

I also put the can in the cage; but a colony of small ants (Crematogaster lineolatus) soon found the eggs, and carried them all to their own dominions. It was amusing to see them work and struggle

to separate them from the hardened mucilage. The spider seemed to be looking at the ants, but probably did not comprehend what was going on; for it soon went to work and made a cocoon, which it carried in its mandibles. Several times I tried to take it away, but could not get it without injuring the spider. At last, after it had carried it over three weeks, I saw the cocoon lying on the ground, and supposed it had been abandoned. On pulling it to pieces, I found it composed of a cocoon and chrysalis shell of some moth, together with bits of stick, and parts of the dried flowers of the common everlasting (Gnaphalium polycephalum). While I was examining the cocoon, the spider came back to where it had left the cocoon, and appeared to be looking for it. I now put the fragments (which were partly held together by the web wound around them) near the spider, which immediately seized them with a quick, almost frantic eagerness.

The next morning it had again made quite a respectable-looking cocoon, — an irregular sort of ball, which it persevered in carrying some two months, and I do not know how much longer; as toward the latter part of October it succeeded in making its escape, and carried its precious charge away.

During all this time it took no food. I captured a number of different insects, and put them in the cage, to all of which it paid no attention. Grasshoppers recognized the spider as a foe, and at first seemed paralyzed with fear, but gradually overcame their fright, and became lively in its company.

Mary Treat.

ARNOLD GUYOT.

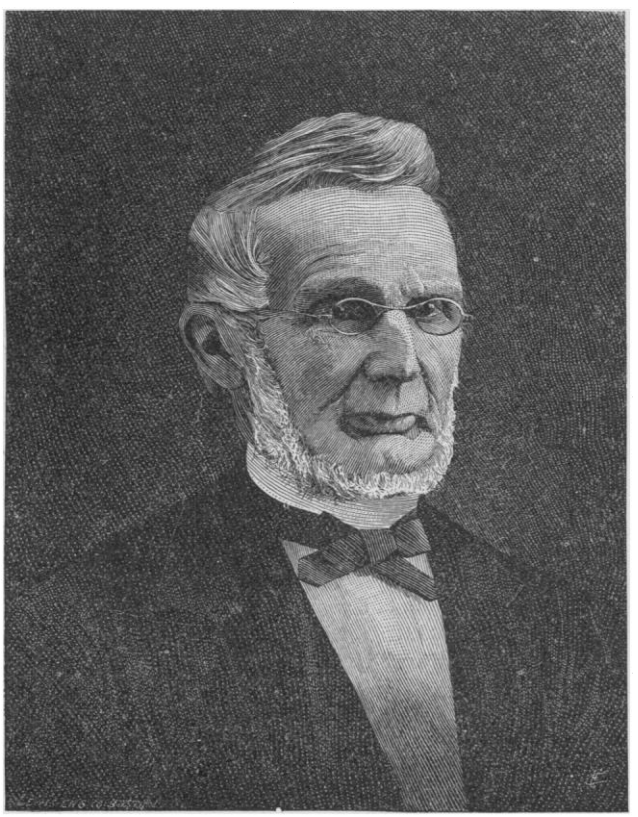
Professor Guyot, whose death occurred at Princeton on the 8th of February, at the age of seventy-seven, is everywhere honored for what he was, as well as for what he did. There is hardly an epithet appropriate to a good scholar, which may not be applied to him, — true, wise, helpful, considerate, devout; accurate, learned, skilful in research, apt to teach, inspiring. His life was devoted to the principle laid down by Smithson for the great institution in Washington, — "the advancement and diffusion of knowledge among men." He was equally ready to engage in a long and tedious investigation, — such as the measurement of a group of mountain peaks, the tracing of lines of bowlders to their sources, the preparation of elaborate tables for the use of meteorologists, and the like, — or to make known in a popular lecture, or before a teachers' institute, or in the conversation of a parlor, or in a series of school-books, the results of his study. He never seemed to be thinking of himself, but always of his subject and his hearers. He cared very little for fame, very much for the study of nature and the education of man.

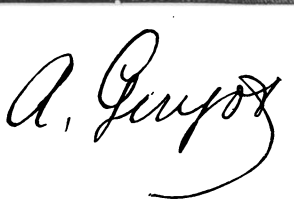
Like Beck, Follen, Lieber, Agassiz, and several who are still alive, he came to America after his academic training had been completed in foreign schools, and devoted himself to the service of his adopted land with an enthusiasm rarely equalled and never surpassed by the native citizen. He avoided the snare of routine which entraps so many of the college professors of this country; but, by always proposing to himself new lines of inquiry and new subjects of investigation, he kept his mind perpetually fresh, so that, until the infirmities of old age attacked him, he was younger than many of his juniors. He required no 'endowment' in order to lead him to investigation, no instructions, no commission, no salary: all he wanted was freedom. So, when vacation released him from his professor's chair, he took to the field, and, with such comrades as were ready to join him, pursued his geographical researches.

His most original out-of-door work was performed in his own land before he came to this country, where, by a study which lasted for several summers, he succeeded in tracing to their primeval origin some thousands of erratic rocks strewn through the valleys of Switzerland. He thus rendered essential help in elucidating the problem of glacial action which his colleagues, Agassiz and Desor, were engaged in solving. Almost as remarkable was the study which he began, soon after coming to this country, of the great range of Appalachian mountains which borders the Atlantic seaboard, from Maine to Georgia. He determined barometrically the height of the principal summits in the White Mountains, then made a prolonged series of similar measurements in the Black Mountains of the south, then produced a memoir (accompanied by a map) of the entire chain, — a memoir which remains to this day the best existing description. More recently he turned his attention to the Catskills, and revealed the fact, that in this group of mountains, so near to the summer-resorts of wealth and intelligence, the highest peaks were not recorded upon the maps, and inferior peaks were regarded by the scientific visitor and the resident forester alike, as the actual summits. He knew that the problems of nature were always at hand; that careful observation and reflection would reveal some truths of interest and importance, whether the observer were placed in a new country or an old. He was one of those rare men who can ask a hard question, and proceed to answer it.

When he came to this country, in 1849, meteorology was hardly worthy to be called a science. He foresaw what light could be thrown on the law of storms and on the variations of climate by accurate observations extended over vast areas. But he saw, also, the need of good barometrical and thermometrical

instruments, and of accurate tables for the reduction of observations. Under the Smithsonian auspices, he superintended the production of both, applying himself with assiduous labor, for several years, to the preparation and publication of the volume which bears his name, and of which a new edition was in preparation before his final illness. It is easy to see that this work of a pioneer, in a department comparatively new, was of fundamental importance. It helped on the meteorological work which was long superintended by Professor Henry and the Smithsonian observers, and was subsequently developed on a grand scale by the government signal-service.





As we are not endeavoring to review in detail the scientific work of Mr. Guyot, but simply to point out some of the elements of his character, we pass on to his influence as a teacher. For a long while after he came to this country he was a professor without a desk, — a peripatetic teacher, engaged by the Massachusetts board of education to unfold the right principles of geographical instruction. His remarkable insight into the relations of the 'Earth and man' had been developed in the atmosphere of Berlin, when Humboldt, Ritter, and Steffens were in their prime. He learned their methods of thought: he worked out his own. His earliest utterances upon this subject were given at the Lowell institute in 1849, when, with the eloquence of an original thinker, he showed how the earth was fitted to be the dwelling-place of the human race. His task was performed with such profound perception of the truth, and with such suggestive and stimulating reflections, that the unpretentious volume of lectures (notwithstanding the fact that science has revealed so much which was then unknown) remains to this day one of the best introductions to physical geography which the general reader can find in any language. The acquaintance which he formed with American schools and teachers showed him how poor and dry and immethodical were the geographies then in use, how flat and unsuggestive the maps. He endeavored to remedy the evil, and for years was occupied, with skilled co-operators, in the production of a series of wall-maps and text-books, which have since been used in every part of the land. It is not too much to say that they revolutionized the methods of teaching geography. Every series of geographies which has since appeared shows the influence of Guyot.

During a period of nearly thirty years he has been a professor in Princeton college, and his name is cherished by hundreds of loving pupils, who have found in him a friend as well as a teacher; but until a recent period he was easily induced to lecture in other places, and his voice has often been heard in distant cities, expounding his favorite ideas.

The intimacy of Agassiz and Guyot, and the parallel courses of their lives, may be beautifully traced in the memoir of Agassiz which Guyot wrote for the National academy in 1877–78, but did not print until April of last year. It is a biographical gem. The two friends were born in Switzerland, were companions in study, were colleague professors in a post-graduate academy at Neufchâtel, were coworkers in glacial researches, were disturbed by political changes in their native canton, were emigrants to America, were neighbors in Cambridge, were comrades in sensible efforts to make science intelligible to the people, were investigators of American problems. In this memoir of his friend, Guyot has revealed himself by many a characteristic touch. After a fresh perusal of its pages, we are led to wonder how much scientific progress would have been delayed in this country, if it had not been for the inspiring and co-operating influence of these noble immigrants.

Like Faraday, Clerk Maxwell, Agassiz, Joseph Henry, and Benjamin Peirce, Guyot was a man who was devoted to research, who believed in carrying it to the utmost, and yet who was never troubled by the idea of a possible 'conflict' between science and religion. To him nature was a manifestation of God. Natural laws were divine laws. There could be no antagonism between them. On the contrary, he believed that the more we learn of the human soul, of the course of history, and of the structure of the world, the more harmonious will they appear as parts of one great plan. His faith, both in science and in religion, was so strong that his influence kept many clergymen from bigotry, many students from atheism. In him they saw a man to whom the study of science and the worship of God were alike obligatory.

THE ALASKA MILITARY RECONNOISSANCE OF 1883.[1]

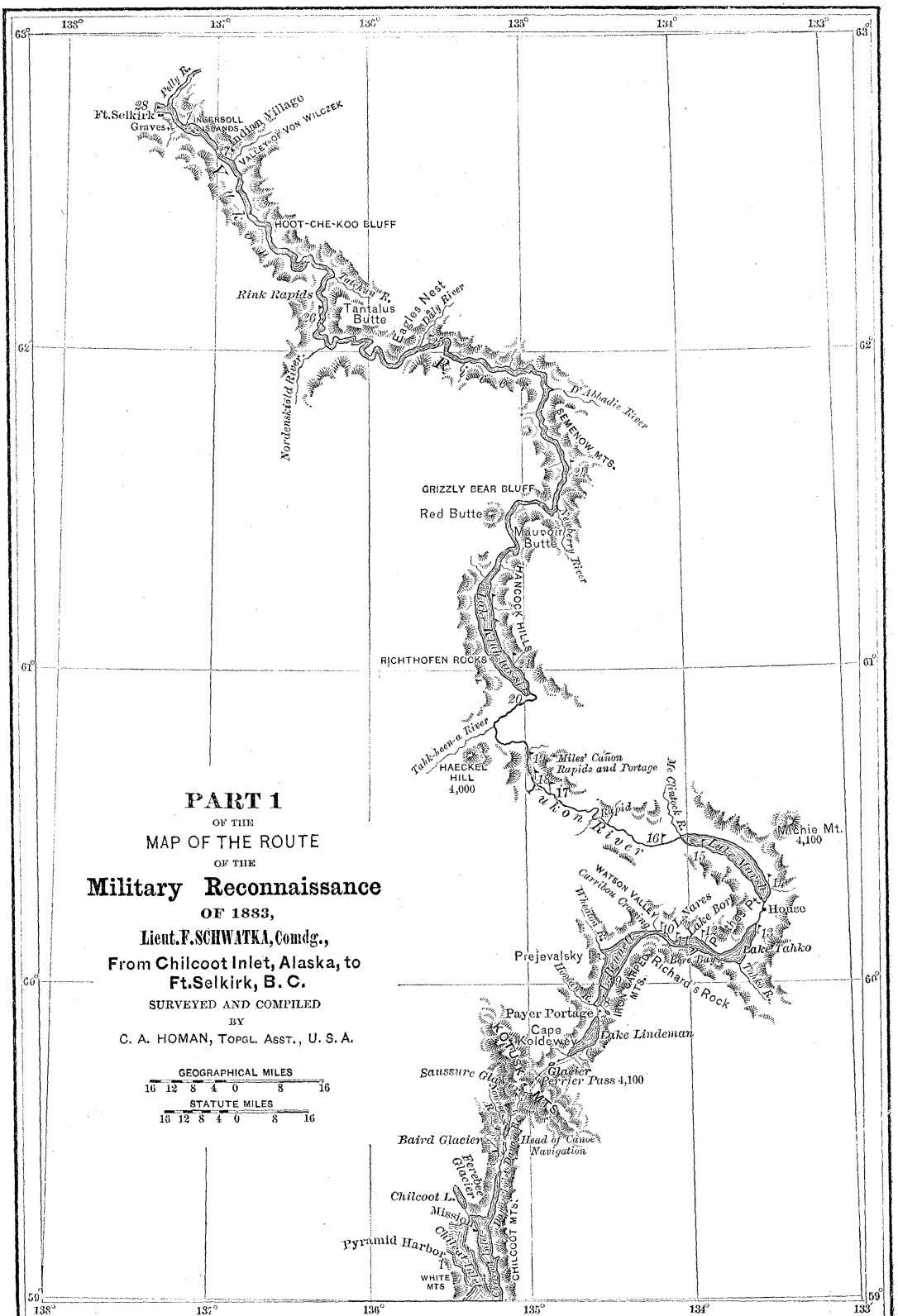
THIS expedition arose from a desire of the department commander in the military department in which Alaska territory is situated[2] to gain some military knowledge of the Indian tribes in that district, and especially in those parts recently opened by mining discoveries, fishing industries, and other causes. Besides gaining this information, it has also done something in the interest of science, especially for geography. The part of the route here treated was almost unexplored, excepting the Chilcoot and Dayay inlets, and the portion from the Kotusk Mountains to Lake Lindeman, which had been traversed by the Krause brothers, sent out by the Bremen geographical society. If such an expression may be considered correct, it was really worse than wholly unexplored, in that the maps and books purporting to be authority over this section of the country were erroneous beyond the limits of sensible guessing. The party consisted of seven white persons, — two officers and five others, — and a number of Indians that varied from two to sixty or more.

There are said to be three or four passes through the glacier-clad mountains that separate the salt-water estuaries of the Pacific from the head waters of the Yukon, two of which are known as the Chilcat and Chilcoot trails; and over these two it has been known for about a century that Alaskan Indians of certain tribes had passed, in order to trade with the Indians on the sources of this great stream. The last (the Chilcoot) is the best of all the trails, and was the one undertaken by the party. Why this or the Chilcat route had not been picked out long ago by some explorer, especially those of comparatively recent dates, who could thereby have traversed the entire river in a single summer, instead of combating its swift current from its mouth, seems singular in the light of the above facts, and can only be explained by supposing that those who would place sufficient reliance in Indian reports to put in their maps the gross inaccuracies cited would also be likely to place reliance in the other reports of the same Indians; and these from time immemorial have pronounced this part of the river as unnavigable even for canoes, being filled with rapids, cañons, whirlpools, and cascades.

Formerly this Chilcoot pass had been monopolized by the Chilcoot Indians, who did not even allow the Chilcats — almost of the same blood — to use it: these were thus forced over the Chilcat route, which has an irksome portage of twelve or thirteen days to the head of the Tahk River (*Tahk-heen-a* of the Chilcats), a branch of the Yukon about half the size of the parent stream where it empties into the latter. Both of the bands on the upper Lynn Channel have united in keeping back the migration of the interior Indians to their waters in order to monopolize this trans-montane commerce. However, of late years, not only have the Chilcats used the mountain-pass of the Chilcoots, but both have allowed the *Tahk-heesh* or 'Stick' Indians of the interior to visit their own domain. I employed some of

[1] Explorations and surveys from Chilcoot mission, Alaska, to old Fort Selkirk, British America.

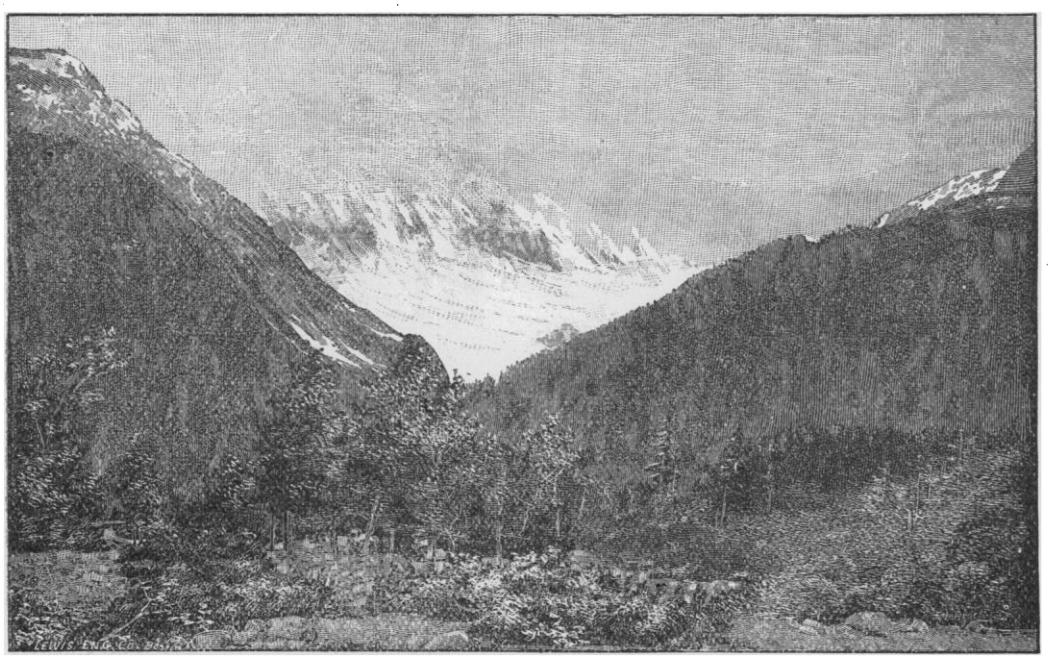
[2] Department of the Columbia, headquarters, Fort Vancouver, W.T.; Brevet Major-Gen. Nelson A. Miles, commanding.


PART 1
OF THE
MAP OF THE ROUTE
OF THE
Military Reconnaissance
OF 1883,
Lieut. F. SCHWATKA, Comdg.,
From Chilcoot Inlet, Alaska, to
Ft. Selkirk, B. C.
SURVEYED AND COMPILED
BY
C. A. HOMAN, Topgl. Asst., U. S. A.
GEOGRAPHICAL MILES
16 12 8 4 0 8 16
STATUTE MILES
16 12 8 4 0 8 16
Ft. Selkirk
Graves
INGERSOLL ISLANDS
Indian Village
VALLEY OF VON WILCZEK
HOOT-CHE-KOO BLUFF
Rink Rapids
Tantalus Butte
Eagles Nest
Nordenskiold River
D'Abbadie River
SEMENOW MTS.
GRIZZLY BEAR BLUFF
Red Butte
Mausoir Butte
Cloudberry River
RICHTHOFEN ROCKS
HAECKEL HILL 4,000
Talk-heen-a River
Miles' Canon Rapids and Portage
Mc Clintock R.
Mt. Michie 4,100
WATSON VALLEY
Caribou Crossing
Wheaton R.
Lake Bennett
Lake Tahko
Tahko R.
Prejevalsky
Richard's Rock
Payer Portage
Cape Koldewey
Lake Lindeman
Saussure Glacier
Glacier
Barrier Pass 4,100
Baird Glacier
Head of Canoe Navigation
Fenchee Glacier
Chilcoot L.
Mission
Pyramid Harbor
CHILCOOT MTS.
WHITE MTS

all these three Indian tribes in my passage through their country.

Reaching Chilcat on the 2d of June, I found, as I had surmised from reports, that miners had pioneered the way some distance down the river in search of gold; but no one seemed to be much the wiser regarding the route, except that, as near as could be gleaned, they confirmed to a great extent the old Indian stories. My suggestion of a raft as my means of conveyance was ridiculed by whites and natives; and they could hardly conceal their contempt when the programme was known to be the passage, that summer, of the whole length of the river. Two or three hundred miles of tortuous lakes and a number of rapids, aggregating eight or ten miles in length, which the Indians never essayed, and around which the miners dragged their whip-sawed boats, were reported to exist, and supposed by all to be sufficient to wreck the raft theory of transportation; and, by the time I started, I felt very anxious myself regarding my plan.

We left on the 7th of June from Chilcat, with thirteen canoes, towed by a steam-launch kindly placed at my disposal by Mr. Spuhn, manager of the North-west trading company. At Chilcoot mission, four or five canoes were added to the already long chain, and the course resumed. Leaving Chilcoot Inlet, we entered another, that the Indians call the Dayay, an exact image of the fiord-like inlets characteristic of this part of the Alaskan coast; that is, having more the appearance of a large river than a salt-water estuary, its sides being immense precipitous mountains, covered three-fourths of the way to the top with a dense growth of spruce, fir, and pine, the latter holding to the lower levels, and capped with blue and white glacier ice that feeds innumerable and picturesque waterfalls coursing down the mountain sides. The mouth of the Dayay was reached that evening, our load of three or four tons lightered to the shore, the canoes and the bundles assorted and given to the different Indian packers, numbering over sixty. The packs varied from thirty-six to a hundred and thirty-seven pounds in weight, the adults generally carrying a hundred pounds, and the boys according to their age and strength. Here was found a small camp of



DAYAY VALLEY, LOOKING UP THE NOURSE RIVER VALLEY.

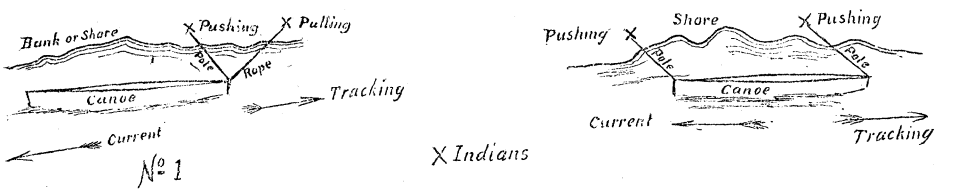
A glimpse of Baird Glacier covered with fog is given. The mountains holding the glacier being twice as high as the one shown on the left, their crests, if they had been visible, would not have shown in the photograph from which this illustration is made, being above the line where it is cut off. The lower edge of the fog-bank is just below the upper edge of the glacier. It is only at night that the fog-banks lift, when it is too late to take photographs.

Tahk-heesh Indians who were hunting black bear, said to be very numerous in this vicinity. During the evening we could hear many hooting-grouse (Bonasa Sabinii) in the spruce woods of the hillsides, this part of the day seeming to be their favorite time for this strain. I could but notice the very peculiar expressions of surprise given by the Chilcat Indians. Whenever one sets up a 'Ya-a-a!' at any thing that attracts his notice, especially the ludicrous mishap of a companion, every one in hearing, from two to two hundred, joins instantly; and a prolonged shout goes up that would astonish one not used to it. This may be repeated a number of times in a minute; and the suddenness with which it commences and stops is astonishing, and strongly reminds one of a gang of coyotes howling, or the baying of Indian dogs, from which I think they have borrowed it.

The head of canoe navigation on the Dayay is ten miles from the mouth of the river, although fully fifteen are travelled by the canoemen in ascending its tortuous course. They 'track' against the current in two ways, two persons being necessary for each method for a single canoe. The diagrams above will show these methods without further explanations.

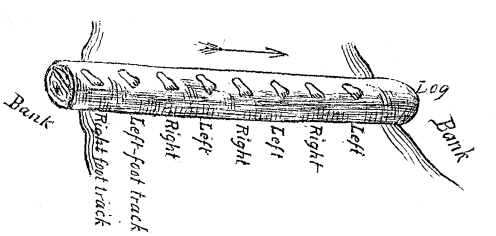
The current of the Dayay is very swift, and it often takes two days' 'tracking' over the navigable part. Every few hundred yards or so the river has to be crossed, and oftentimes a hundred yards is lost in this undertaking. From the head of canoe navigation on the Dayay to the point where the Indian packers left the party is twenty-six miles, or the true length of the portage. Two miles and a half beyond the head of canoe navigation the Cutlah-cook-ah of the Chilcats comes in from the west. This is really larger in volume and width than the Dayay, the two averaging respectively fifty and forty yards in width by estimation. I shortened its lengthy name, and called it after Professor Nourse of the U. S. naval observatory. Large glaciers feed its sources by numerous waterfalls, and its cañon-like bed is very picturesque. Both the Nourse and Dayay, like most streams fed by glaciers, have their waters noticeably white and chalky. Not a 'bite,' nor a 'rise,' could be had in either with bait or flies, although the Indians catch trout in them in their fish-wears.

At the head of the Nourse River the Indians say there is a very large lake. Its westward-bounding mountains are capped with an immense glacier, that could be traced along their summits for probably ten or twelve miles, and was then lost in the lowering clouds that these icy crowns form from the moisture-loaded atmosphere of the warm Pacific.[1] These light fogs are frequent in the warm days, when the difference of temperatures at the upper and lower levels is more marked, clearing up at night as they approach each other.



METHODS OF TRACKING A CANOE UP A RAPID.

The march of the 10th of June was a very rough, fatiguing one of about ten miles, consuming from 7.30 A.M. till 7.15 P.M. It brought us to the foot of the mountain pass on the other side of which we should find the sources of the Yukon. I noticed that day that all my Indians, in crossing logs over streams, always turned the toes of both feet in the same direction (to the right), although they kept the body square to the front, or nearly so, and each foot passed the other at every step, as in natural walking. The advantage to be gained was not obvious to the author; as the novice, in attempting it, feels much more unsafe than in ordinary walking. Every evening was spent by the Indians in their gambling games, their orgies

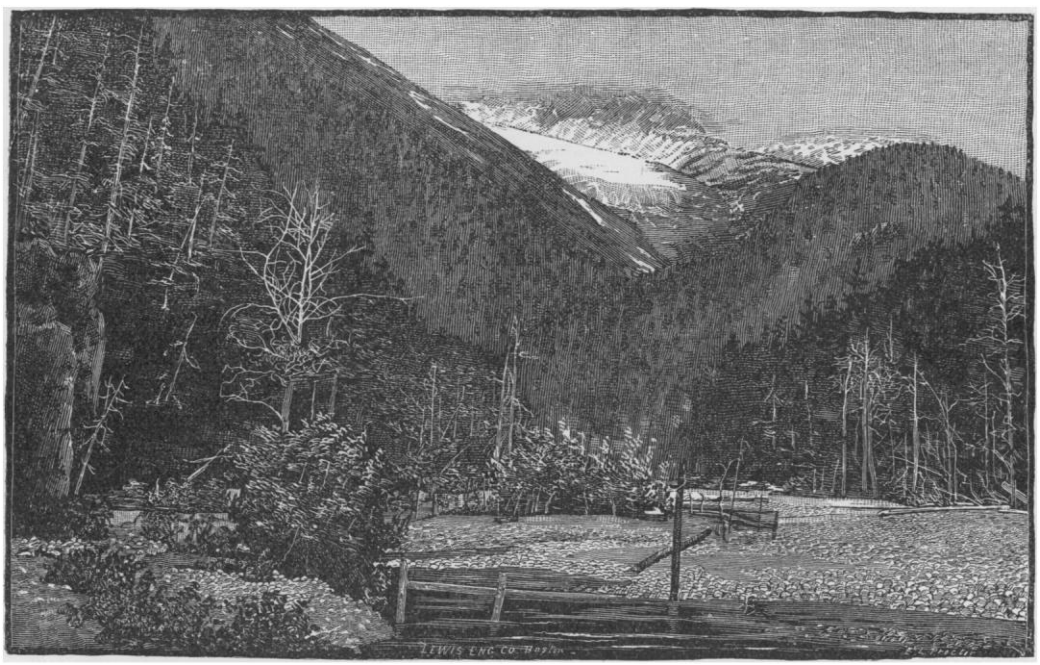


POSITION OF THE FEET IN WALKING A LOG, AS PRACTISED BY THE ALASKAN INDIANS.

[1] This glacier (see illustration, p. 222) was named after Prof. S. F. Baird of Washington, D.C.

often continuing until midnight or past. This, added to their rapidly improvised birchbark hats with pictures upon them that would prohibit their being sent through the mails, does not speak well for missionary efforts among them.

On the 11th we crossed the pass (Perrier Pass), ascending to forty-one hundred feet above the sea-level, being among the clouds formed by the glaciers in the upper third of the ascent. It was the usual severe alpine climbing; the agility and endurance of the Indian packers, with their immense loads, almost surpassing belief. The entire distance of six or seven miles was on the deep snow, the depth of which could only be inferred. Once through the Perrier Pass, the descent is rapid for a few hundred feet to a lake of about a hundred acres in extent, which was yet frozen over and the ice covered with snow. It very much resembled some old extinct crater, and I doubt not but that it was active in ancient times. Here there was no timber, nor even brush, to be seen; and the gullies of the granite hills, and the valleys deeply covered with snow, gave the whole scene a decidedly arctic appearance. My Indians, in following a trail on snow, whether it were up hill, on a level, or even with a slight descent, always stepped in each other's tracks, so that my large party made a trail that looked as if only five or six had passed over; but, when going down a steep descent, each one made his own trail, and they scattered out over many yards. I could not but be impressed with the idea that this was worth considering in estimating their numbers under such circumstances. From the little crater-like lake at the very head of the Yukon, the trail leads northward through a valley that converges to a gorge; and while on the snow in this we could hear the water gurgling under the snow bridge on which we were evidently walking. Farther on, where these snow arches were too wide, they had tumbled in, showing in many places deep perpendicular snow-banks, oftent wenty to twenty-five feet in height. Passing by a few small lakes on our left, some yet containing floating ice, we caught sight of the main lake late in the afternoon, and in a few hours were upon its banks. It is a beautiful sheet of water, ten or eleven miles in length,[1] and looked not unlike a limited area of one of the broad inland



A VIEW IN THE DAYAY VALLEY.

A finger of the Saussure Glacier is seen peeping round the mountain, the rest being covered with fog.

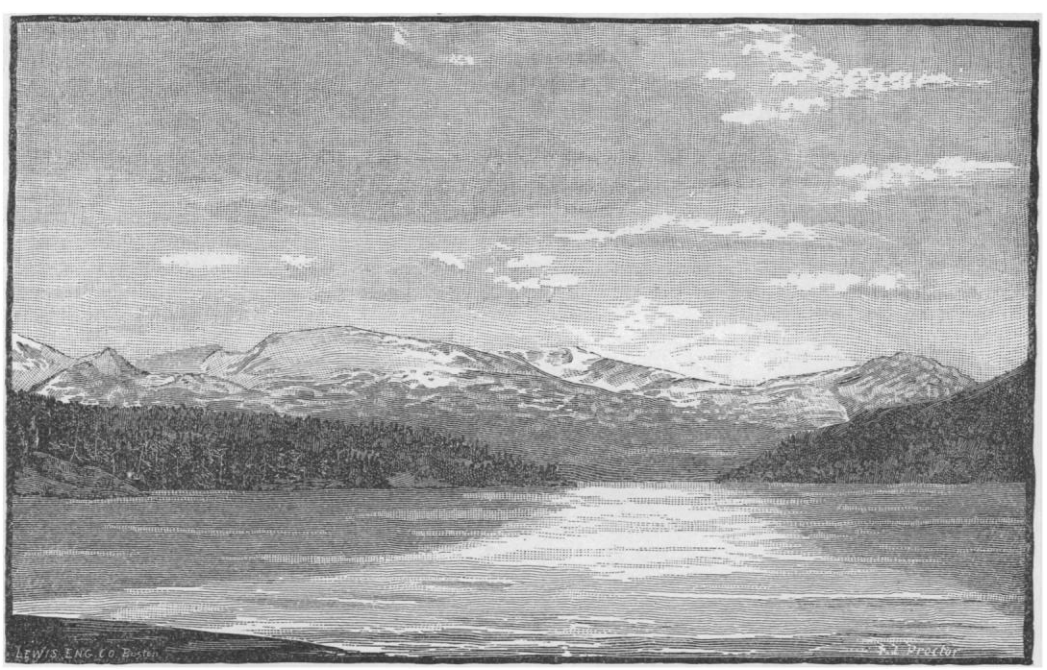
[1] Named in honor of Dr. Lindeman of the Bremen geographical society.

passages traversed by the steamers plying to Alaskan ports farther south. Fish were absent in these glacier-fed streams and lakes, but we managed to kill a few dusky grouse (Tetrao obscurus) and green-winged teal (Nettion carolinensis) to vary the usual government ration; but all were tough beyond measure, it being their breeding-season. Over Lake Lindeman were seen sea-gulls and the graceful little arctic tern that I recognized as an old and garrulous companion. Of large game, a small black bear cub was the only thing seen; although mountain goats were abundant a short distance back in the hills, one having been seen by us in the Perrier Pass.

The next day we commenced building our raft on Lake Lindeman; although the logs were very small, consisting of dwarfed spruce and contorted pine. Fifteen by thirty feet was considered large enough until we commenced to load it, when we were forced, during a heavy gale on the 15th, to send it ahead with but half a load and three men, the remainder reached, where birchbark canoes commence. The remainder of the party took a whole day in struggling overland through the tangled brush and marshes of the gullies, and climbing the steep, smooth granite banks that separate them from the ridges covered with a labyrinth of fallen timber.

At its northern end Lake Lindeman is drained by a small river fifty to sixty yards in width, full of rapids and cascades, and about a mile in length, where it empties into a large lake that I named after Mr. James Gordon Bennett, a well-known patron of American geographical research.

The raft was shot through the connecting river, June 16, and the dimensions enlarged to fifteen by forty; although, counting all projections, it really came nearer sixteen by forty-two. Around this series of rapids the Indians portage their effects on their backs; and I named it Payer Portage, after Lieut. Payer of the Austro-Hungarian expedition of 1872–74. By the 17th of June, at midnight



LAKE LINDEMAN.

The view is taken from the upper (southern) end of Payer Portage, looking (south) toward Kotusk Mountains. Perrier Pass is on the extreme right wrapped in fog. There are higher ice-capped mountains in the distance, not shown here.

of the material being stowed in two dilapidated wooden canoes, — fair samples of the very few that exist from here until old Fort Selkirk is

it was light enough to read print like that of *Science*, and continued so through the month, except on very cloudy nights. Har-

lequin ducks were noticed on the southern end of Lake Bennett, and black and brown bear and caribou tracks in the valley of a small stream emptying into the lake near by. A couple of Tahk-heesh Indians were here encountered, one of whom stammered considerably. Among my Chilcat packers I also noticed one that was deaf and dumb, and two or three afflicted with cataract in the eye. On the 19th of June we commenced traversing Lake Bennett. Through the ice-fields capping the timbered mountains to the east of the lake protruded a great many dull red rocks and ridges, specimens of which, found in the terminal moraines of the little glaciers putting down the gulches, showed iron; and I named this bold range the Iron-capped Mountains. By three P.M. it was blowing a gale; and by five the waves were washing over our raft, and threatening to tear it to pieces, for there was not a single log that extended the whole length of the raft proper. We accordingly put into a cove, where we obtained four large spruce to strengthen the raft, and on the 21st resumed the journey, reaching the northern end of Lake Bennett that evening. The lake is thirty miles long, and flanked by precipitous hills three thousand to thirty-five hundred feet high, capped with glaciers. At its north-western face there come in a couple of streams, forming a wide, flat, and conspicuous valley that we all felt sure was going to be our outlet as we approached it. Several well-marked buttes spring from this valley, giving it a very picturesque appearance; its largest river being sixty to seventy-five yards wide, but quite shallow. I called it Watson valley, after Professor Sereno Watson of Harvard.

The draining river of Lake Bennett is about two hundred yards wide, and is called by the Tahk-heesh, 'the place where the caribou cross;' these animals, in their migrations, fording its wide, shallow current, and passing out and in through Watson valley. It is hardly two miles long before it expands into another lake, whose general course now turns to the east; and our old friend, the steady, summer south wind, was of no avail for sailing our huge craft. Although this lake (Lake Nares, after Sir George Nares) was but three or four miles long, its eastern trend kept us three days before we got a favorable wind, the banks not being good for tracking. Although small, Lake Nares was one of the prettiest in the lacustrine chain. The country was perceptibly opening; and trap, granite, gneiss, and metamorphic and eruptive rocks generally, were giving way to the sedimentary and fragmental. Many level places were appearing, the hills were less steep, and the snow disappearing from their crests. Roses of varying hues were in bloom, and also wild pansies; while wild onions lined the lake-shore in profusion, and everywhere there was a general change of verdure, and variation for the better. Grand terraces in beautiful symmetry on the two sides of the lake plainly showed its ancient and subsiding levels. These, too, — in a less conspicuous manner, however, — had been noticed on the northern shores of Lake Bennett. Lake Nares drains through a short river of a hundred yards into another lake[1] about eight miles long, and on whose limited shore-line I was compelled to make two camps and a half-dozen extra landings, so baffling was the wind on which we had to depend. Two bungling side-oars on the huge raft allowed us to make about a half a mile an hour with laborious effort, a wall-tent for a sail driving us along as fast as two miles and a half under the most favorable wind. An oar on the bow and stern gave us steering apparatus, and a dozen strong wooden poles served us as pries over many a lake and river bar of sand, gravel, and mud.

During one of these temporary landings on the shores of Lake Bove, some of my Indians set fire to the green spruce-trees by a large blaze kindled under them, and a dense volume of smoke ascended high in the heavens. Late that day a smoke was seen north of us some ten or fifteen miles away, and our Indians told us it was an answer to the one they had accidentally made that morning. These signal-smokes between the two bands were formerly quite common; the Chilcats thus heralding to the Tahk-heesh that they had crossed the Kotusk Mountains, and were in their country for trading purposes. Not many years ago, as I was told by an old Hudson-bay trader in these parts, this Chilcat-Tahk-heesh trade has been known to be so great that not less than seventy-five or eighty of the Chilcats and Chilcoots crossed the mountains twice annually, each carrying a hundred pounds of trading-material, or a grand total of eight tons, to be exchanged for furs that were collected from a wide circuit by intertribal commerce. Fort Selkirk, established by the Hudson-bay company near the junction of the Pelly and Yukon, interfered with their trade for a brief period, until 1851, when a war party of Chilcats extended their trading-tour nearly five hundred miles in order to destroy it; and its blackened chimneys still attest their success.

Lake Bove has a deep bay in its southern

[1] Lake Bove, after Lieut. Bove of the Royal Italian navy.

face; and into this, our Indians reported, empties a large river. Rounding Point Perthes (after Justus Perthes of Gotha), nearly white with its covering of limestones, some of them almost true marble in their brilliancy, we enter Tahko Lake, eighteen miles in length by our measurement (forty-five, according to one guess on record). A well-deserved remark regarding conjectural geography in order to 'fill out' maps, charts, or books, I hope will not be found amiss at this point. In one of these we were given to understand that from here the Indians make Fort Selkirk in a day and a half in their birchbark canoes. There are no birchbark canoes used on the lakes, nor as far as Selkirk. The very few Indians living on the four hundred and thirty-three miles between Tahko and Selkirk never stay in their cramped wooden canoes over six hours during a day, and would therefore have to paddle over each mile at the rate of one minute and thirty-five seconds.

Tahko Lake receives a small stream on the south, which, followed up, leads to one of the mountain passes that debouch upon the waters of the Pacific, so said our Indians. The same authorities gave us to understand that it drains smaller lakes, and has a smaller bed than the rivers and lakes through which we had passed; and its appearance, as we sailed by, seemed to confirm their opinions, thus showing that we had been on the main stream, or the Yukon proper.

(To be continued.)

FLOODS IN THE OHIO.

No river of the same magnitude fluctuates in depth so much as the Ohio. Twice, or oftener, during most years, the river rises at Cincinnati to a stage of forty-five feet six inches by the gauge at the water-works, when the occupants are compelled to vacate the premises at the foot of Commercial Row. A greater depth than this is a flood, and occasions more or less loss and suffering. Extreme low water is two feet, and extreme high water of February, 1883, was sixty-six feet four inches, — a difference of sixty-four feet four inches.

The gauge at the water-works was fixed in 1858, and all observations since then are referred to that standard. This gauge is intended to show the depth of water on two principal bars near Cincinnati, — Four-Mile bar above, and Rising-Sun bar below, the city. All observations of the stage of water of which we shall speak have been reduced to this gauge.

We may mention the noted floods preceding the establishment of the gauge in 1858.

1774. — It is traditional that at about this year there was a great flood in the Ohio. Vol. i. p. 343, of the *American pioneer*, states that two white hunters were detained some time in March of this year at the mouth of the Big Kanawha by a remarkably high freshet, which, from fixed marks on Wheeling Creek, is supposed to have been equal to that of 1832.

1789. — Various records show that there was a remarkable flood this year observed by the first white settlers, which must have been of much longer duration than any of later date.

1792. — It is within the recollection of some now living, that four years after the settlement of Losantiville (Cincinnati) there was a flood that covered the land on which Columbia now stands. The stage of water must have been sixty feet or more.

1815. — Another great flood occurred this year, but it was of less magnitude than that of 1792.

1832. — There are several points in Cincinnati where permanent high-water marks were made on Feb. 18, 1832; and they almost exactly agree in showing that the stage of water was then sixty-four feet three inches. The population of Cincinnati was then twenty-eight thousand; and, as the city was situated upon the river-bank, nearly the whole of it was inundated by a flood, which increased continually for ten days.

1847. — Cincinnati contained about ninety-six thousand people at this date. The river began to rise on Dec. 10, and on the 17th reached sixty-three feet seven inches.

The following table records the highest stage of water at Cincinnati each year since 1858, as well as those just given for 1832 and 1847: —

Year.	Date.	Feet.	Inch.	Year.	Date.	Feet.	Inch.
1832	Feb. 18,	64	3	1871	May 13,	40	6
1847	Dec. 17,	63	7	1872	April 13,	41	9
1858	June 16,	43	10	1873	Dec. 18,	44	5
1859	Feb. 22,	55	5	1874	Jan. 11,	47	11
1860	April 16,	49	2	1875	Aug. 6,	55	5
1861	April 19,	49	5	1876	Jan. 29,	51	9
1862	Jan. 24,	57	4	1877	Jan. 20,	53	9
1863	March 12,	42	9	1878	Dec. 15,	41	5
1864	Dec. 23,	45	1	1879	Dec. 27,	42	9
1865	March 7,	56	3	1880	Feb. 17,	53	2
1866	Sept. 26,	42	6	1881	Feb. 16,	50	7
1867	March 14,	55	8	1882	Feb. 21,	58	7
1868	March 30,	48	3	1883	Feb. 15,	66	4
1869	April 2,	48	9	1884	Feb. 14,	71	¾
1870	Jan. 19,	55	3				

The flood-stage of 1875 was remarkable as occurring in summer, when the river is in most years low.

The great flood of 1883 was of unprecedented magnitude, and so great a rise was entirely unexpected. The stage of water had not exceeded sixty feet for thirty-seven years. By it the whole of those parts of Cincinnati and the towns on the opposite side of the river — Covington, Newport, and Dayton, Ky. — located nearest the water were inundated. In Covington, in all, perhaps 350 houses were submerged. In Newport not less than 2,100 houses were flooded. In Dayton and Bellview, Ky., over 400 houses were under water.

In Cincinnati, travel on many of the street-car lines was suspended; nearly all the freight and passenger depots were submerged; all but two of the railroads stopped running; fifteen of the largest coal-yards were under water; and the gas-works suspended, leaving the city in darkness. More than 1,500 business-houses, and nearly 3,700 dwelling-houses, were inundated, causing more than 2,400 people in Cincinnati alone to become objects of charity, for whom shelter, covering, clothing, and food must be provided.

It is within bounds to say that one-tenth of the population in and around Cincinnati needed assistance of this kind. The Associated charities superintended the distribution of aid to those suffering. From Feb. 12 to March 5 this organization relieved 5,260 families, or 24,111 persons. It issued 105,141 rations, and supplied 2,046 families with clothing, 1,916 families with bedding, and 647 families with coal. It also distributed 3,991 pairs of boots and shoes.

The pecuniary losses that resulted from this flood can never be precisely known, but it has been estimated that along the two thousand miles of shores inundated it aggregated sixty millions of dollars.

The town suffering most in proportion to its size was Lawrenceburg, Ind., which was completely inundated. It is so situated that at this stage of water the Miami River runs directly through the town, pushing houses from their foundations, and sweeping away every thing movable.

The flood was due to two storms, — the first from Feb. 3 to 6, in which about 3.5 inches of rain fell at Cincinnati; and the second on Feb. 10 and 11, in which the rainfall was about 2 inches. These storms extended to the head waters of the Ohio, and fell upon frozen ground; so that the water could not soak into the earth, but was carried at once into the water-courses.

The flood of 1884 arose from a single storm on Feb. 4 to 6, in which the precipitation was unusual in amount and rapidity, being as much as 4.46 inches in eight hours less than three days. This storm, combined with the warm weather, caused a general thaw over all the region from which the feeders of the Ohio come, and sent large volumes of water into the rivers, besides the immediate rainfall.

When we consider what an unusual combination of circumstances is necessary to cause a stage of water exceeding sixty feet, and that such an occurrence cannot be ordinarily expected more than about once in a quarter of a century, it appears most remarkable that two such floods should happen in successive years.

A WOMAN'S JOURNEY TO THE KARAKORUM VALLEY.

MADAME UJFALVY, who recently accompanied her husband to Kashmir and Baltistan, has published an interesting and lively account of the glacial region of the Himalayas, which she was the first European woman to penetrate. In the village of Shamba, in the Kulu country, on the occasion of a ceremonial visit to the temple by the rajah, it is customary for the priests to sacrifice a she-goat. Once undertaken, the priests may not eat until the sacrifice is complete; and the assent of the animal to its own death, without which it may not be killed, is supposed to be indicated by a trembling of the body. The unconscious creature is not always in a trembling mood; and to induce the same the priests squirt cold water into its ear, which usually has the desired effect. On one occasion, the authoress relates that even this failed, and the goat, outraged by such treatment, escaped to the rugged mountain side, and, even after recapture, refused to gratify its captors. Put to their wits, the priests finally plunged it bodily into the icy mountain stream which dashes through the village. Taken out again, it naturally trembled with its whole body; and the sacrifice was finally completed to the satisfaction of all, especially of the priests, who had already imagined themselves perishing of famine.

Srinagar, capital of Kashmir, sometimes known as the oriental Venice, seemed less attractive than report had made it. The streets were narrow canals of stagnant and offensive water, in which swarms of ragged people disported themselves. Dirt was too evident to be ignored. Only when evening set in, and all contrast disappeared under the moonlight, did this singular and sombre town seem to harmonize with the magnificent mountains which surround it. There are some hundred thousand inhabitants; and, besides the finest quality of shawls, they produce the finest and most artistic work in silver and copper. The passage to Baltistan from Srinagar traverses a singular plateau fourteen thousand feet above the sea. The earth is bare, and undulated as if in waves. It is the bed of an extinct glacier, and surrounded by mountains, between which the wind rages, rendering it passable only in the three summer months. Even in

September, snow-hurricanes may destroy rash travellers. Though English authorities had informed them that rain was impossible on this plateau, the party were drenched. Marmots and bears alone inhabit this solitude. Grass is rare, and, at one place where abundant, is said to be poisonous for animals. These regions offer a desolate grandeur, unsoftened by vegetation.

The descent to Baltistan and the sources of the Indus was through scenery equally wild and melancholy, so that the first signs of cultivation met the eye as grateful relief.

The Baltis are Mussulmans, and chiefly remarkable for their devotion to the game of polo; which, in fact, originated here, and for which their well-trained, tough little mountain ponies are admirably adapted.

Their capital is Skardo; but the purest type of the race is found in the Shigar valley, which contains the largest glaciers in the world after those of Greenland, and the highest mountains in the world after Mount Everest. The glaciers form an unbroken line for nearly a hundred miles. Mount Dapsang of the Karakorum range is only some two hundred feet lower than Mount Everest. But even here the Shigar River waters an attractive oasis of some six miles in extent, with fields of millet and beans, and orchards weighed down with fruit, among which nestle tombs, mosques, and picturesque though uncomfortable habitations. The apricots and melons of this region are delicious.

The party returned by another and very difficult route, which followed all the windings of the Indus; yet here and there little villages were set, like verdant nests, among the rocks. In spite of the incessant conflict with nature, which a residence here entails, the people are devoted to their country, and prefer it to any other.

The journey to Shigar was due to the munificence of the Maharajah Rambir Singh of Kashmir; and its scientific results, which remain to be published, are believed to be important.

THE ARTIFICIAL PRODUCTION OF RAIN.

IN his anniversary address delivered to the Royal society of New South Wales, Mr. H. C. Russell, the president and government astronomer, deals at some length with the subject of producing rain artificially. He begins with a few points in its history, telling first how Arago, finding the practice of firing guns common in some of the departments of France, had tried to trace the origin of the custom, which probably began in 1769. A retired naval officer, who at sea had seen water-spouts destroyed by cannon shots, made his home in a district that suffered from violent rain and hail storms, and determined to try the power of shot and shell upon these new foes; and, setting up his battery, his success was such that the district was protected from the violent storms. The practice became popular in France; and up to the year 1806, and even later, many communes kept a battery of small guns for this purpose, the commune of Fleury even going so far as to get a cannon which used a pound of powder at each discharge. Arago could not trace what the effect had been, but he at least was not convinced that it had had any good effect; and after a time the practice became obsolete. Volta's biographer says that "it is well known that Volta thought a possible advantage might be found in having large fires during thunder-storms;" his reason probably being, that the smoke would serve as a conductor for the electricity, and so prevent dangerous discharges.

To test the effect of the discharge of artillery on the weather, Arago examined the weather-record of the Paris observatory for many years, especially for the days adjacent to those on which the regular gun-practice took place in the fort, situate somewhat less than two miles from the observatory. The firing took place at this fort on certain days in the week, from seven to ten A.M., about one hundred and fifty shots being fired. Arago found, that, out of 662 days preceding the practice, 128 were cloudy; out of 662 days of practice, 158 were cloudy; out of 662 days following practice, 146 were cloudy; which he regarded as proof that the discharge of heavy artillery does not seem to have the effect of dissipating the clouds.

Struck at one time by the amount of destruction caused by hail-storms, Arago proposed drawing off the electricity by means of wires carried up to great elevations by captive balloons; but, when he came to the practical consideration of the scheme, it was soon seen that each balloon would not protect more than, perhaps, a thousand square yards, — a mere speck of France. In later years he was led to doubt the value of such a means of protection.

Arago relates, that, in tracing the history of the use of cannons, he found that bells, and especially church-bells, had preceded them; and it was at one time firmly believed that the vigorous ringing of church-bells was sufficient to dissipate dangerous storms. Mr. Russell finds that up to 1810, or later, the idea was popularly prevalent that storms might be destroyed or prevented by fire or guns; and he thinks that a complete change to the opposite opinion has taken place since then. He says, —

"Australia, like Africa, wants the rain-doctor to make rain, not drive it away. It is not only in Australia, however, that the belief in the artificial production of rain exists. In America, during the civil war, it was a matter of common observation that rain followed the great battles; and the belief in this became so general, that farmers began the practice of making large heaps of brushwood on each farm, and, when they wanted rain, lighting them all together. I cannot find any reference to the results of this system in the Smithsonian publications, in which almost every subject of this kind is dwelt upon; but the practice seems to have been given up."

Mr. Russell then alludes to the well-known little volume by Mr. Edward Powers, published in 1870, and entitled 'War and the weather, or the artificial production of rain;' and to the review of this book in *Silliman's journal*, inclining to the opinion that great battles do exert some influence in the production of rain, but failing to accept Mr. Powers's incom-

plete discussion of the facts as proof. He turns next to Espy's conviction, that rain might be produced economically whenever it was wanted, and cites Professor Henry's opinion in the matter:—

"I have great respect for Mr. Espy's scientific character, notwithstanding his aberration, in a practical point of view, as to the economical production of rain. The fact has been abundantly proved by observation, that a large fire sometimes produces an overturn in the unstable equilibrium of the atmosphere, and gives rise to the beginning of a violent storm."

The opinion of Professor Everett, president of the Meteorological society, is also cited. He believed that great battles and great fires tend to produce rain, but that rain does not, of necessity, follow battles or fires.

The climate of Australia being peculiar, Mr. Russell has endeavored to collect the records bearing upon the question there; and, there having been no battles (except a mimic one, which produced no rain), he passes to an examination of the meteorological conditions of the times of the great fires which have occurred in Sydney since 1860, and assumes, that, if a fire produced rain, it would fall within forty-eight hours. His record embraces forty-two large fires (including two serious explosions), extending over a period of twenty-one years; and he concludes that there is not one instance in which rain has followed within the forty-eight hours as an evident consequence of the fire.

In cases where it is asserted or believed that rain has been produced artificially, it would be interesting to examine whether the rain was due to the fires or to ordinary meteorological changes. While it is evident that some of the most competent authorities in England and America think that under certain circumstances rain may be produced artificially, Mr. Russell thinks they all carefully avoided saying what the circumstances were; and he proceeds to develop some idea of what they are, from a consideration of the natural conditions under which rain is deposited, and adducing certain instances as illustrations, from nature, of the conditions under which the leading scientific meteorologists of the day tell us that rain is formed. He says,—

"If we can get a measure of these [observed] effects, it will serve as a guide in estimating what would be required to make rain. At Sydney the average relative humidity is 73, and at Windsor it is rather less; and we have just learned that such atmosphere lifted from Windsor to Currajong, 1,800 feet, deposits 60 per cent more rain. If we could make it rise up over Sydney 1,800 feet, we might fairly expect to get 60 per cent more rain. Now, a wall built 1,800 feet high, and of considerable length, so that a wind would not divide and go round it, but go over, would have the desired effect; i.e., to lift the air and cause rain: but any thing that would do this would serve the purpose, and it may be done by fire; but of course the fire must have the effect of lifting the atmosphere up. It will not do for the products of the fire to rise up slowly, mixing with the air, and making it drier as they rise. If it is to have the effect of a wall,—that is, making the whole of the air passing over rise up 1,800 feet,—it must act as an explosion would do, suddenly, or by a constant uprush of such violence that it would rise up 1,800 feet. The force necessary to do this is easily computed, and we can in this way get a money value for the work to be done. At Sydney the average velocity of the wind is 11 miles per hour; and all the air passing over is to be lifted, and the weight of it on the surface is, say, $14\frac{1}{2}$ pounds on the square inch, and $13\frac{1}{2}$ pounds at 1,800 feet high. At least, for our present purpose, these figures are sufficiently exact. The average weight to be lifted, therefore, is 14 pounds on the square inch. The fire must have the same length as the proposed wall, for the same reason, and a breadth equal to the forward motion of the air in a given time. We have therefore to lift a weight of 14 pounds on the square inch over a surface of 1,000 feet by 10 miles (52,800 feet), and raise it up 1,800 feet every minute. To do this we will assume that coal is employed, and that, as it is burnt in the air, the whole of its heat will be effective. The mechanical equivalent of good coal is 14,000,000 foot-pounds for each pound of coal used. We have, therefore,—

$$\frac{14 \times 12 \times 12 \times 1{,}000 \times 1{,}800 \times 52{,}800}{14{,}000{,}000 \times 112 \times 20} = 6{,}110 \text{ tons per minute} =$$

8,800,000 tons in a day, or nearly 9,000,000 tons of coal per day, to increase the rainfall 60 per cent, at a cost, at 10*s.* per ton, of £4,500,000.

"Of course this is only a theoretical experiment, and ignores all the heat lost by radiation and imperfect combustion; but it serves to give some idea of what is necessary to disturb the course of nature, and, I think, shows how utterly futile any such attempt would be, even near the sea, where the air is moist."

It would seem unreasonable, Mr. Russell concludes, to hope for the economical production of rain under ordinary circumstances; and our only chance would be to take advantage of a time when the atmosphere is in the condition called unstable equilibrium, or when a cold current overlies a warm one. If under these conditions we could set the warm current moving upwards, and once flowing into the cold one, a considerable quantity of rain might fall; but this favorable condition seldom exists in nature.

ROTATION OF JUPITER.

MR. W. F. DENNING has recently published an investigation of the rotation of certain spots on Jupiter which confirms in a remarkable degree a theory already propounded that this planet resembles the sun in not only rotating in different times in different latitudes, but in having the period of rotation of its equatorial region shorter than that of regions in middle latitude. From the red spot which has formed so conspicuous an object on the planet for nearly five years, the following rotation periods are obtained at different times:—

Interval.	Number of rotations.	Period of rotation.
		h. *m.* *s.*
1880, Sept. 27–1881, March 17	413	9 55 35.6
1881, July 8–1882, March 30	640	9 55 38.2
1882, July 29–1883, May 4	674	9 55 39.1
1883, Aug. 23–1883, Dec. 5	251	9 55 38.8

A gradual lengthening of the period is thus indicated. On the other hand, from a white spot near the equator the following times are obtained:—

Interval.	Number of rotations.	Period of rotation.
		h. *m.* *s.*
1880, Oct. 20–1881, Sept. 30	842	9 50 5.8
1881, Sept. 30–1882, Dec. 23	1,095	9 50 8.8
1882, Dec. 23–1883, Nov. 25	823	9 50 11.4

We thus have the paradoxical result that the rotation period is more than five minutes less at the equator than in the latitude of the red spot. The effect of the motion of matter from one part of the planet to the other would be to make the actual time of rotation longer as we approach the equator. The opposite effect noticed in the times of rotation of spots suggests the possibility that the latter may be endowed with a motion of their own; partaking, perhaps, of the nature of cyclones on the earth's surface.

RED SKIES A CENTURY AGO.

I VENTURE to suggest that recent phenomena are a re-appearance of those of 1783. It will therefore be interesting to give a sketch of the phenomena of 1783, in order to ascertain their similarities and differences.

In the spring of 1783 one of the greatest eruptions of Shaptar Jokul in Iceland resulted in the largest lava-streams ever observed, ten miles long, five miles wide, and a hundred feet deep. Obviously, great quantities of ash must also have been thrown up.

Towards the end of May, *höhenrauch* (dust-haze) was remarked first on the western coast of Europe. It was so thick as to render the sun invisible on the horizon, and even at mid-day it was only a red indistinct disk. It was first noticed, May 29, at Copenhagen, then in England, on July 6 and 7 in France, and rapidly spread over Europe, northern Africa, and eastern Asia. Neither rain, heat, nor cold dispelled it; and, having reached a maximum at the end of July, it remained visible till Sept. 26, 1783, at Copenhagen, thus lasting four months.

There are numerous instances of volcanic ash being carried very great distances. The dust from Coseguina in Central America was carried a hundred and seventy miles, towards Jamaica, and was so dense there as to darken the sky. Hence meteorologists concluded that the *höhenrauch* of 1783 was due to dust from Shaptar Jokul.

The similarity of the 1783 phenomenon with the present seems to me extraordinary. The frightful volcanic explosion of Krakatoa in the Sunda Straits, which began on Aug. 26, 1883, supplies, as did Shaptar Jokul, the material. The splendid redness at sunrise and sunset was first reported from India; and it will be an interesting inquiry to study the spreading of the phenomenon, as was done in 1783.

It was first seen in Japan at the end of August, but only reached Germany in November; and, from the dates of the various records, it seems evident that the ash was thrown into the upper regions of the atmosphere in the tropics. The extraordinary duration corresponds with that of 1783, and is to be explained by the fineness of the dust.

The differences are, that in our country the obscuration of the sun is less than in 1783, which would accord with the greater proximity of Iceland than Java.

It seems probable that rain and snow may bring some of the dust to the earth. I have therefore examined the residue of the rain-gauges from the 1st of December, but thus far without any positive results. Hence I infer that the dust is at present too high for it to be brought down: it is therefore most necessary that such observations be made in many places.

These views have been advocated by Lockyer, who, through spectroscopic research, has been led to the same conclusion.

Before, however, a final decision upon one or another hypothesis can be given, it will be necessary to collect observations, researches, and investigations, from as many points of the earth's surface as possible, which will doubtless be done in meteorological journals.

G. KARSTEN.

Kiel.

BROWNE AND BEHNKE'S VOICE, SONG AND SPEECH.

A practical guide for singers and speakers; from the combined view of vocal surgeon and voice-trainer. By Dr. LENNOX BROWNE and EMIL BEHNKE. New York, *G. P. Putnam's Sons*, 1884. 322 p., illustr. 8°.

A CAREFUL perusal of this work must establish the conviction in the mind of the reader, that the authors thoroughly understand their subject. In reference to voice-formation, many hitherto obscure points are made clear, and many hitherto doubtful points are settled, on physiological, and therefore indisputable, grounds. Thus, the distinctions between the various 'registers' of voice are proved to be due to demonstrable differences in the adjustments of the 'voice-box' and the vocal ligaments. A great deal of information is communicated on the subject of voice-cultivation, and the prevention and treatment of the ailments of 'voice-users.' The precepts in regard to hygienic habits for singers and speakers, their diet, and their clothing, so as to secure unrestricted freedom for the chest and the abdomen, are both judicious and important. About one-half of the book is taken up with the single subject of respiration. The proper management of the breath is shown to be a matter of the highest possible value to singers and speakers. The conclusions arrived at, in reference to the healthful and efficient use of the lungs, commend themselves as thoroughly sound and practical; but condensation in the treatment of the subject would have been a great improvement, as the same principles are again and again repeated under different heads.

The use of the laryngoscope is recommended more than will be thought generally advisable, so far as practical results are concerned; but the authors have handled this instrument to

good purpose in illustrating their descriptions of the larynx by photographs taken from the reflected images in the laryngoscopic mirror. Thus, the chink of the glottis is shown in the act of forming sound. Photographs are also given of the interior of the mouth, showing the positions of the soft palate during the singing of certain notes. These and other illustrations greatly add to the interest of the elaborate descriptions of the processes of phonation.

The book commences with a plea for the study of vocal physiology. The importance of a knowledge of the *principles* of vocal physiology to singers and speakers, no one will dispute; but it may be doubted whether any practical benefit can be derived by voice-users from the anatomical detail of the structure of the vocalizing-apparatus, which is here so copiously exhibited. This part of the treatise might have been much condensed with advantage, so far as its practical applications to speaking and singing are concerned. This portion of the book may, perhaps, have its utility to voice-*trainers*, who ought fully to understand the mechanism which they undertake to direct; but voice-users could not 'govern the ventages' in speech or song with any better effect from knowing the shape and name of the individual cartilages which they set in motion.

In the chapter on defects and impediments of speech, both stammering and stuttering — very indefinitely distinguished — are traced to one common source: "A fault in respiration is at the root of all the mischief." No system is presented or advocated for the relief of stammerers, for the specified reason that "there is none that is honestly applicable to all cases." Something more definite might have been expected under this head. For facts relating to the vocal registers, and to the anatomy of the larynx and the chest, this book will be useful as a work of reference in the libraries of scientific teachers of speech or song; but it will not add much to their knowledge of practical vocal physiology.

M'ALPINE'S BOTANICAL ATLAS.

The botanical atlas: a guide to the practical study of plants, containing representatives of the leading forms of plant-life, with explanatory letterpress. By D. M'Alpine, F.C.S. 2 v. New York, *Century Company.* 1883. 52 pl. 4°.

It is difficult to see why this work should be entitled '*The* botanical atlas' (except to distinguish it from the other atlases compiled by the author), since many of its best plates are from an entirely different treatise, which may as fairly lay claim to being called '*The* atlas;' namely, that of Dodel. Judging by its size, it is apparently designed to be used in class demonstrations; but its sumptuous binding somewhat unfits it for the laboratory table, while, on the other hand, the figures are not large enough to be used in place of lecture diagrams. The work is in two volumes, one of which is devoted to phanerogams, the other to cryptogams.

The drawings in the volume on flowering-plants are, for the most part, very good, some of them possessing remarkable clearness of outline; and the coloring is above the average in delicacy of effect. The impression made by this volume as a whole is, that it has received an amount of care which could have been more usefully expended in a slightly different direction. With the exception of the words 'magnified' and 'highly magnified,' there is nothing to serve as a guide to the relative size of the figures of corresponding parts. Every practical teacher of botany would have suggested to the compiler the desirability of furnishing what is never out of place in an atlas of any kind, to wit, a scale of parts. This is always serviceable in the treatment of microscopic or of any minute figures: in fact, without it they are often misleading to the beginner. It may be said, that it is impracticable to state in every case the approximate amount of enlargement or reduction; but certainly in most cases it is not impossible to give a hint as to the relative sizes of the figures.

Drawings of the size given in this atlas are chiefly useful for individual and not class study. With a greater enlargement, the plates would have proved useful in classes of ordinary size. A few attempts have been made to provide plates of suitable size for class use; but the subjects have not always been so well chosen, nor so successfully treated, as those in this volume. The well-known series made by Professor Henslow is so crowded that the effect of the exquisite drawing is obscured. In the lack of good wall-plates, we have a want which ought to be supplied. If the plates in the present volume were larger, so that they could be employed for demonstration before classes of moderate size, they would go far to meet this need. Their size now restricts their employment to the individual student, and this necessarily lessens their utility; but this is a matter for publishers to consider.

The volume relating to cryptogams contains twenty-six plates, some of which include a large number of figures copied from standard

authorities, a small number of the figures being original. The object seems to be quite as much to attract the eye by brilliant coloring as to furnish the student with accurately drawn microscopic details. The quality of the plates varies considerably: for, while those of Volvox and Mucor are effective, the same cannot be said of those of some of the lower forms, — as Nostoc, Oscillaria, Gloeocapsa, etc., — where a mass of color takes the place of clearness of outline, and important details are not well brought out. This may, however, be the fault of the lithographer, rather than of the original drawings. Considering their biological importance, better and more numerous figures of Myxomycetes might have been given. The plates of Fucus and Cetraria are unnecessarily bad, considering that there are several works from which excellent figures could have been copied; and the same may be said of the plate of Florideae, where no good figure of the procarp or cystocarp is given, and that of mosses, where the peristome is badly drawn. The antherozoid of a fern is represented not only without the usual bladder-like appendage, but also without cilia.

The text consists of brief descriptions of the figures, with directions for studying the objects themselves in the laboratory; the whole forming a skeleton to be filled out by the instructor. It seems to us that the use of the term 'gonidium' in the sense of non-sexual spore is hardly warranted. The word has a technical meaning in lichens, and its use in other orders has been superseded by better terms; and it is certainly undesirable to speak of the gonidia of Penicillium, for instance.

The work is likely to have a large sale among amateurs who wish a hasty glance at the subject; but it would be better for students to purchase some of the text-books, like Sachs or Luerssen, where they will find the same figures, and a full text as well.

ECONOMIC ENTOMOLOGY.

Injurious insects of the orchard, vineyard, etc. Illustrated with over seven hundred and fifty woodcuts and twenty-five pages of classified illustrations. By MATTHEW COOKE. Sacramento, *Crocker*, 1883. 472 p., illustr. 8°.

DURING the last few years, there has been a great growth in the popular appreciation of the importance of economic entomology. As a result of this growth, the demand for popular works on this subject has increased. To supply this demand, numerous publications have appeared in rapid succession. Of especial interest among these publications are the manuals of Miss Ormerod, Mrs. Treat, Mr. Saunders, and Mr. Cooke.

The work of the last-named author resembles in many respects the works of the others. Like them, it is largely a compilation; its chief merit being that it gives, in an easily accessible form, descriptions and figures which were scattered through many works. There is, however, some original matter. This consists of notes respecting various Californian species, which were studied by the author while serving in the capacity of chief executive horticultural officer of that state. The insects are discussed under the head of the plants they infest. The descriptions are written in a clear and popular style; but in some cases they are too brief, and in others they bear the marks of hasty compilation. A peculiar and excellent feature of the work is the bringing-together into one part descriptions of all the remedies suggested. These are referred to throughout the work by numbers. In this way unnecessary repetition is avoided. In the introduction a history of the legislation to prevent the spread of injurious insects in California is given. The work is profusely illustrated; but the good figures are not new, the new ones are not good, and all are poorly, printed. Still the book will be found to be a very useful one, especially to the fruit-growers of California.

Twelfth report of the state entomologist on the noxious and beneficial insects of the state of Illinois. First annual report of S. A. Forbes, for the year 1882. Springfield, Ill., 1883. 10+154 p., illustr. 8°.

IN this work we have the results of the first half-year of Professor Forbes's administration as state entomologist. In studying the report we are deeply impressed, both by the amount that has been accomplished and by the thoroughness with which the work is being done. Several of the articles in the report have been published separately during the past year, and have been noticed already in these columns. Of the other articles, the notes of experiments in the destruction of the European cabbage-worm, the account of a new plant-louse infesting cucurbitaceous plants, and studies on the chinch-bug, are the most important. The observations on Micrococcus insectorum Burrill, a bacterium parasite of the chinch-bug, are especially interesting.

We are glad to see that Professor Forbes has adopted the plan of intrusting some of the more special investigations to his assistants, and publishing the results they have

obtained in their own words, over their own signatures. One can hardly over-estimate the value of the added enthusiasm which assistants will bring to their work under this method. Not only will they do more work, but it will be of a much higher quality; and the office in which they are engaged will be able at an early day to command the services of a corps of specialists instead of mere day-laborers. At the same time a large part of the work of each individual in an office of this kind must be merged into what shall go out as the work of the office. And it is not the assistants alone who suffer from this; for the chief must devote much attention to executive duties, which shorten greatly his time for study.

In this report there are two papers by Professor Forbes's assistants. The first is an important article on the gall-mites, by Mr. H. Garman. It deals with the general characteristics of structure and habits of the Phytopti, and includes descriptions of seven new species, and the cecidii of several species for which names are not proposed. Previous to this, but three species have been indicated by name in the United States. The second paper is by Mr. F. M. Webster, and is an excellent account of the angoumois grain-moth and its parasites. There is also an account by Prof. T. J. Burrill, of the habits of Agrilus granulatus, which he has found to be a destructive borer of the Lombardy poplar.

First annual report on the injurious and other insects of the state of New York. By J. A. Lintner, state entomologist. Albany, 1882. Senate doc. No. 93. (Issued October, 1883.) 381 p., 84 cuts. 8°.

After an interval of eleven years, we are again favored with a report of a state entomologist of New York. This first report by Mr. Lintner is a large one, and evidently represents a great amount of work. The first eighty pages are devoted to a history of American economic entomology, and a discussion of the more important insecticides now in use. Then follow accounts of thirty species of insects. Of especial interest among these are those of Polype laricis, Crambus vulgivagellus, and some species of Anthomyiidae. In an appendix there is a very complete account of the writings of Dr. Fitch.

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

GOVERNMENT ORGANIZATIONS.

Geological survey.

Paleontology. — During the field-season of 1883, Prof. W. W. Fontaine was detailed to collect and study fossil plants in Virginia. Late in July he began an examination of the tertiary strata in the vicinity of Richmond. Throughout the remainder of the season his field-work was continued on the mesozoic and tertiary of eastern Virginia, after which he was occupied in the preparation of drawings of the specimens collected.

Prof. L. C. Johnson, who has been working in the South Atlantic district, principally in Alabama, has returned to Washington after a most successful season. He is now engaged in unpacking and arranging the large collections that he secured during the summer and autumn. Several barrelfuls of material from the Claiborne group in Alabama were obtained; and the sorting of the extremely interesting collection included in them has kept him busy since his return from the field.

Mr. J. B. Marcou (assistant to Dr. C. A. White, in charge of the department of mesozoic paleontology) reports that a collection of very interesting fossils has been sent to the National museum from Skonum Point, British Columbia, by Mr. James G. Swan of Port Townsend, W. T. These fossils are being examined by Mr. Marcou, who says some of them are new, and that others are evidently identical with specimens from the coal-bearing rocks of Queen Charlotte Island, described for the Canada geological survey by Dr. J. F. Whiteaves in his 'Mesozoic fossils of Queen Charlotte Island.' Mr. Marcou says that the collection presents quite an oolitic facies.

Miscellaneous. — Mr. F. M. Pearson, topographer, who has been working in eastern Tennessee, says that the waste of valuable timber in that region, which has only recently ceased, is almost inconceivable. The finest specimens of walnut and cherry timber are found, and are used by the inhabitants for fence-rails, fire-wood, and other wasteful purposes. Since the survey has been working in the country, it has been instrumental in working a change in this respect, and the people are beginning to appreciate the value of their timber resources. Another result is, that the mineral resources are becoming known, and investments both in timber and in mineral properties are now being made where but a short time ago they would have been considered unprofitable.

Dr. Thomas M. Chatard of Baltimore has been appointed assistant chemist on the survey, and will be in the laboratory at Washington with Prof. F. W. Clarke.

Educational rock suites. — The survey proposes to collect suites of about one hundred representative rocks, to be used in teaching the elements of lithology. Two hundred specimens of each kind of rock will be

gathered; and they will be obtained as nearly identical as practicable, according to a scale adopted by the survey. Eventually, therefore, two hundred suites, of about a hundred specimens each, will be made up. They are to be accompanied by descriptive text, and issued to colleges and other educational institutions. The work of collection will be divided among the members of the survey, and will be distributed through about two years' time.

Additions to collections. — During the season of 1883 two hundred boxes of specimens were sent in to the main office of the survey by the various field-parties. They included rocks, minerals, fossils, and mineral waters. This number by no means comprises all the collections made, as a large number have not as yet been forwarded to Washington.

In the Rocky Mountain district, in charge of Mr. S. F. Emmons, with headquarters at Denver, Col., twelve hundred specimens of rocks from the Silver Creek mining-district were collected, and series of the type-specimens of hypersthene-andesite of Buffalo Peaks were secured.

After the close of field-work in the Yellowstone National Park, Mr. Joseph P. Iddings was sent to the Eureka district in Nevada to make collections of rocks for the educational rock series. He obtained sufficient material for two hundred cabinet specimens of five characteristic rocks. Three of them illustrate types of igneous rocks from the Great Basin, and two belong to the sedimentary series. They will all be fully described in the 'Geology of the Eureka district.'

Harvard college herbarium.

Additions. — Of the 8,755 sheets incorporated during the year, over 5,000 (holding probably 7,000 specimens) were derived from the rich herbarium of the late George Curling Joad of Wimbledon, near London, from which at least 3,000 more are still to be selected. For this most valuable collection of the plants of Europe and adjacent parts of Africa and Asia, or rather for such portion of it as will be retained, the herbarium is indebted to Sir Joseph Hooker, director of the Royal gardens at Kew, to which establishment it was bequeathed, and by whom, after certain selections had been made from it for the Kew herbarium, it was generously made over to this herbarium for the supply of its needs, the residue to be passed on to the National museum at Washington. So rich and abundant this collection proves to be, — containing, as it does, the principal published *exsiccata*, and most of the critical or local species of Europe, in authentic and attractive specimens, — that, notwithstanding the ample appropriation on our part, the materials which pass from our hands will still well represent the principal part of the European flora. This collection is supplemented by the presentation (in continuation of former gifts) of several hundred plants of Algeria and Tunisia, on the part of Dr. Cosson of Paris, who is engaged upon a Flora of Algeria.

The demand which such foreign collections make upon the time of the curator, Mr. Sereno Watson, and the director, Dr. Asa Gray, although very considerable, is small in comparison with that which has to be devoted to the critical examination and naming of the multifarious collections, large or small, which are incessantly poured in from all parts of our own country. A response to these demands cannot be avoided, generally cannot be deferred, in justice to the collectors and donors, and without risk of diverting the streams, which, flowing in ever since its establishment, have enriched this herbarium, and rendered it adequate to its leading purpose. But they press so heavily and unceasingly upon the officers, that they greatly retard progress in the preparation of works undertaken, and which ought to be proceeded with.

RECENT PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Ottawa field-naturalists' club, Canada.

Feb. 14. — Mr. W. Hague Harrington presented a list of Coleoptera captured in the neighborhood of the city during the past six years, and read a brief paper introductory to it. The list was stated to contain 926 species; but, as a large number remain yet undetermined, the list, when published, will include about 1,050 species. Many species are recorded which were formerly unknown in Canada, and there are three or four beetles which are probably new species. Mention was made of a few of the rarer forms which had been captured, such as Chrysobothris pusilla, Phymatodes thoracicus, Fornax badius, F. Hornii, and Sarpedon scabrosus. Of the latter, two females had been taken, which were now in the respective collections of Drs. Horn and LeConte. The collection was stated to be poor in Carabidae, Dytiscidae, etc., and comparatively rich in Buprestidae, Elateridae, Cerambycidae, and other families which had been specially investigated as containing species destructive to vegetation. The Ottawa fauna was briefly compared with that of several other districts, and was shown to resemble most closely that of Lake Superior. —— Mr. J. B. Tyrrell read a paper on the 'Revision of the Suctoria,' giving an outline of the different opinions held by entomologists in regard to the fleas, and the results of his own microscopical researches. A brief mention was made of some of the species which occur upon Canadian animals, and of the fact that other species had been found, both on mammals and birds, which it had been as yet impossible to determine. ——After an interesting discussion, the report of the conchological branch was read by Mr. F. R. Latchford. One species, Patula asteriscus Morse, had been added to the list of shells, and additional specimens of several very rare species had been obtained. Of the new shells, several specimens

had been obtained by Mr. Harrington while sifting moss for small Coleoptera; and with it occurred a number of other species, including Hyalina milium Morse, Pseudohyalina exigua Stimpson, Vertigo milium Gould, and V. Gouldii Binney. Among many other interesting and valuable facts was reported the rapid increase, in and around the city, of Limax agrestis Linn. In 1882 a single individual of this species was found in a garden. During the past summer it was found in hundreds in this garden, and other gardeners complained of its destructive attacks. The advent in Ottawa of this voracious species of foreign origin (long known in cities along the Atlantic coast) is a fact of much economic as well as scientific interest. After the reading and discussion of this report, the members spent some time in examining the specimens exhibited by Messrs. Harrington, Tyrrell, and Latchford, in connection with the papers and report.

Torrey botanical club, New York.

Feb. 12. — Dr. Newberry gave an account, continued from a previous meeting, of the vegetation bordering the line of the Northern Pacific railroad. Many of the trees are undoubtedly specifically the same as eastern ones, although considered and described as distinct. They should probably be referred to varieties of the same species. All are, no doubt, descended from the same ancestors, although now altered by the difference in surrounding circumstances. Many of the smaller plants are identical, but generally the aspect of the vegetation is very distinct and striking. The Douglass spruce (Abies Douglassii, Lindl.) and Pinus Lambertiana, Doug., are scarcely less in size than the famous 'big trees' of California. Some of the former are three hundred feet high and six feet in diameter. The annual rings are sometimes half an inch wide, showing very rapid growth. One specimen, about five feet in diameter, showed five hundred annual rings. Mountain mahogany (Cercocarpus ledifolius, Nutt.) has a very hard, dense wood, considered superior to coal for making a bright, hot fire. Several species of the genus Berberis are conspicuous features, owing to the showy racemes of berries. They are called indiscriminately 'Oregon grape.' Several species have apparently not been described. The 'Manzanita,' a name given to several species of Arctostaphylos, produces a fruit resembling a small apple, which is used as a food by the Indians. No hickory-trees are found, and only one hazel (Corylus rostrata, Ait.). The berries of Gaultheria Shallon, Pursh., are much used by the natives, as are also the fruit of the 'service-berry' (Amelanchier alnifolia, Nutt.) and several species of Vaccinium. Spirea millefolium, Torr., is very abundant and conspicuous: it would make a very ornamental garden-shrub. Artemisia tridentata, Pursh., is the common sage-brush of the region. Kalmia glauca grows the same as with us; and Rhododendron Californicum, Hook., is hardly different from our R. maximum, L.

Amongst the herbaceous plants are to be seen, particularly, three species of Mimulus, — cardinalis, Lewisii, and luteus. Antennaria dioica is very conspicuous with its red flowers. Many species of the genus Phlox are abundant and conspicuous. The showy genus Castilleia is also well represented. One of the most extensively represented genera is Eriogonum, — more than twenty species in this region. Many species of Ribes are to be seen, some of which have apparently not been described. Fire has devastated immense tracts of forest, and completely altered the appearance of the landscape in many places. Where the ground has been burnt over, there generally springs up a thick growth of Pteris and Vaccinium.

Peucedanum ambiguum, Nutt., is an important food-staple, the root being dried and powdered.

Cincinnati society of natural history.

Feb. 5. — Mr. W. H. Knight read a paper on the motions of fixed stars and on non-luminous bodies of space. —— Dr. W. A. Dun exhibited a series of relics from the Swiss lake dwellings, and read a short paper describing them. —— Prof. Joseph F. James gave a brief account of some observations on the common Caladium. After cutting off a growing, healthy leaf, a jet of water shot out from the apex of the unfolding leaf, and continued flowing with a rhythmical movement at the rate of a hundred and eighty pulsations per minute for several hours.

Academy of natural sciences, Philadelphia.

Jan. 10. — Miss S. G. Foulke stated that the modes of reproduction of Clathrulina elegans are four in number, — by self-division, by the instantaneous throwing-off of a small mass of sarcode, by the formation and liberation of minute germs, and by the transformation of the body into flagellate monads. The fourth mode is significant in bringing to light a new phase in the life-history of the Heliozoa. The Clathrulina, in which the phenomena were observed, withdrew its rays, and divided into four parts, as in the ordinary method; but the sarcode instantly became granular and of a rough surface. Then followed a period of quiescence, in this case of five or six hours' duration, although in other instances lasting three days and nights; after which one of the four parts began slowly to emerge from the capsule, a second following a few moments later. While passing through the capsule, these masses of sarcode seemed to be of a thicker consistence than the similar bodies, which, in the ordinary method, instantly assume the Actinophrys form. After both had passed completely through, for nearly a minute they lay quiet, gradually elongating meanwhile. Then a tremor became visible at one end, and a short prolongation of the sarcode appeared waving to and fro. This elongated at the same time into a flagellum, the vibrations becoming more rapid, until, at the same moment, both the liberated monads started away through the water. They were followed for about ten minutes, when both were lost to sight among a mass of sediment, and the fear of mistaking one of the common monads for them led the observer to abandon the search. Another monad was followed through various movements, and finally seen to attach the tip of its flagellum to the glass, and revolve swiftly for a few moments, when

instantly the whole body became spherical, rays were shot out, and the transformed monad was in no point, except that of size, to be distinguished from its Actinophrys-like relative. The whole development, from the time when the monad began its free life, occupied two hours and some seconds.

Prof. H. C. Lewis called attention to a mass of cast-iron from the Emaus iron-works, near Allentown. The iron contained crystals of graphite, which, again, held portions of cast-iron in their interior. The composition of cast-iron, which permits the formation of graphitic carbon, was considered, and compared with that of steel. Although the mass of iron must have been at one time in a molten state, it yet contained pieces of unaltered anthracite coal, which undoubtedly remained unconsumed in consequence of the entire absence of the oxygen necessary for its combustion. The presence of such unconsumed pieces of coal in a mass of molten iron might be held as illustrating the way in which carbon may exist in meteorites, or chalcopyrite in trap rocks.

Dr. Benjamin Sharp, referring to his recent communication on the visual organs of Solen ensis, stated that he had since determined the presence of similar organs in the mantles of the clam, the oyster, and the sand-clam. Their presence was made evident by the retraction of the mantles when shadows are passed over them. The structure of the peculiar cells, supposed to be primitive eyes, was the same as that of the cells before described in the siphon of Solen, including the presence of the transparent portion at the end of each.

Chicago academy of sciences.

Jan. 14. — The committee, consisting of Dr. H. A. Johnson and B. W. Thomas, appointed to investigate the bowlder-clays underlying the city, made its report upon a disk-shaped organism found both in the clays, and also in the filtrate from the water-supply, of Chicago. They were yellow, apparently flat or concavo-convex, and varied in size from $\frac{1}{85}$ to $\frac{1}{250}$ of an inch. Similar organisms have been found by several naturalists in the Devonian rocks of North and South America; and they were described by Dr. Dawson under the name of 'Sporangites,' and considered by him as macrospores of some acrogenous plant. Professor Orton of Ohio believes there are several species of varying sizes. We have, however, say the committee, none so large as discovered by Professor Orton. Our largest forms are not more than $\frac{1}{85}$ of an inch in diameter, and our smallest about $\frac{1}{250}$ of an inch. We have two, and possibly more, varieties. One has a well-marked ledge or zone around it, and extending, perhaps, an eighth of the way across it. Within this are the spines noted below. Others have no such markings, and do not, as a rule, have spines; and while some are a very light yellow, and almost transparent, others are of a dark reddish brown, and almost opaque. Whether these differences are sufficient to justify a separation of them into different species seems to be at present doubtful. So far, no forms have been met with by either of us, having any thing like a stem or point of attachment. Nor have we found any of the spherical or oval sacs which were contained in the collections of Mr. Derby, in Brazil.

There are found here, however, what we believe have not been found elsewhere; namely, on many of the disks, well-marked spines. These are, as a rule, clustered together, occupying a central portion, the diameter of which is three-fourths of the entire breadth of the disk, but in some instances the spines cover the entire surface. Along with these disks are, in quite large quantities, broken pieces of what seem to have been leaves, perhaps pinnate in form. Besides these, dark globular masses, which seem to be possibly spores or microspores, are frequently seen on the disks, and also scattered among them. These are — at least, in some cases — also contained within the substance of the disk. They are regular in form, and vary in size from $\frac{1}{600}$ to $\frac{1}{3000}$ of an inch in diameter. They are evidently organized; for in some cases there is seen a reticulum, or net-work, within the dark substance of the body. With these microspores, if such they are, are also masses of dark matter that, at least in some cases, are made up either of these globular forms alone, or of these and other organic material, such as the stems described by both Professor Dawson and Professor Orton. The clay beneath the city of Chicago and in the vicinity is full of bowlders of various sizes, from that of a walnut up to several cubic yards; and on many of these bowlders are well-defined ice-markings. Some of the smaller bowlders are shale which has never been ground down, and in these unchanged pieces we also frequently find large numbers of disks. These masses of shale, so far as we can ascertain, are identical with the shales of the upper Devonian formation. It will be seen that the disks are evidently not the product of their present location. They have been in some far-off age embedded in the shales; and subsequently these shales have been ground to clay, and, with other material constituting the bowlder-clays, have been redeposited beneath the lake and the adjacent shores. They are now undergoing another dispersion; for they are washed from their present position in the Chicago clays, and are mixed with the sands and alluvium, to be carried by the currents and winds to some new resting-place. Consequently our water-supply is now full of these products of probably some millions of years ago. They were perhaps water-cresses, and might have been of excellent flavor when fresh. They were fragant with gums or spices, as we know from their present composition. They are not now probably injurious to health, but they are especially valuable as a reminder, that in some widely different time, and amid very different surroundings, an abundant marine vegetation was being produced which has been preserved to our own day.

Vassar brothers' institute, Poughkeepsie, N.Y.

Jan. 2. — C. B. Warring, Ph.D., exhibited the gyroscope, and gave the explanation of its action the following form.

Dr. Warring, in giving his explanation of these phenomena, said it was important to clearly grasp these two principles: 1. A body set in motion will con

tinue in motion until something stops it; 2. A body moving in any direction is not retarded by a force exerted at right angles to its direction.

We will suppose the ring to be laid aside, since it serves only for holding the disk, and that the disk or wheel is cut away until only a narrow strip is left, like two arms extending in opposite directions from the axle: its form will then resemble a T-square, which will now be used to illustrate the actions of the gyroscope.

Hold the stem of the square in the left hand, close to the end, and make the cross-piece vertical; hold the left hand still, and let the cross-piece move up or down: evidently it will describe part of a circle. If it is held so that the cross is just in front of a plumb-line, so that both can be viewed at once, it will be seen that the upper end of the cross moves away from the plumb to the right, while the lower moves away from it also, but to the left. If, while the left hand remained stationary, the cross had been allowed to drop freely, the top and bottom would evidently acquire a certain horizontal motion, one to the right, the other to the left. If, now, the T-square be quickly turned over, so that the top and bottom change places, this will not interfere with motion previously acquired: the bottom (which has now become the top) will continue to move to the left, while that which was the top will move to the right; and, as the motion continues (as in case of a pendulum), the ends of the cross are pushed back to where they were, and the instrument rises to its first position.

This explains why the gyroscope, in apparent defiance of the law of gravity, remains, when supported only at one end, in a horizontal position.

To understand why the instrument rotates around the central point, in a direction always the opposite of that of the top of the disk, the T-square is again brought into service. Hold it as before, and let it fall a few inches: as in the first experiment, the top, when the T goes down, gets a motion towards the right; but, before the instrument can be reversed, it must go half way, and point horizontally, instead of up and down. Evidently the motion which sends the upper end to the right will push the instrument (if the top was revolved towards the south) towards the north: hence the horizontal motion.

The horizontal motion is slow in proportion as that of the disk is rapid, because of the movement of the arms of the T. If the T turns slowly, it has more time to give motion to the ends of the arms, and consequently they push it around faster. If the T turns very quickly, it falls a very short distance (has so little time): hence the ends of the arms get very little motion, and, of course, can impart but little. A quick motion of the disk, therefore, makes a slow horizontal movement, and a slow motion of the disk makes a quick horizontal movement.

A careful consideration of the above will make it easy to see why the gyroscope ceases to maintain itself if the lateral (or horizontal) motion is stopped; for, in order to maintain itself, the motion imparted to the ends of the T-square, when vertical, must be expended in lifting: if spent in any other way, nothing is left to overcome gravity. Now if, as the square falls, and the T has become horizontal, some obstacle prevent its moving still farther to the right, its motion in this direction would cease; and, of course, when it arrived at the lowest point, nothing would be left to lift the instrument.

Another paradox is, that the instrument must fall somewhat, in order to produce any of its peculiar phenomena; but this, too, is easily explained. Every thing depends upon the two extremities of the T getting a motion, one to the right and the other to the left, when the T is vertical. If the T does not fall, or if it is not lifted up (for either movement will do equally well), there will be no such motion: only, if the first sends the instrument north, the other will send it south.

This directly or impliedly explains all the phenomena of the gyroscope.

NOTES AND NEWS.

THE death of Guyot has been soon followed by that of another of the notable scientific men, who, educated in Europe, took up their lot with us, and became, so to say, wholly our own. Dr. George Engelmann of St. Louis — our oldest botanist (excepting the venerable Lesquereux), as well as an eminent physician, for a time a fellow-student with Agassiz in Germany — died on the 11th inst., at the age of seventy-five. A biographical notice may be expected in an ensuing number.

— The *Journal of agricultural science* proposed from the North Carolina agricultural station recently, and to which we referred Dec. 28, has met with universal approval and most unexpected support.

Nearly one hundred shares of stock have been taken upon the plan proposed; and the Houghton farm proposes to assume all of the mechanical work of a monthly journal, and guarantee this part of its expense for one year. Without any special effort to secure them, about three hundred subscribers are reported.

In response to a cordial invitation of the commissioner of agriculture, a meeting will be held to organize this enterprise, at the Department of agriculture at Washington, at ten A.M., Wednesday, Feb. 27. All the friends of the scheme are urged to be present at this meeting, and participate in the inauguration of the journal. It is hoped that each agricultural college, experiment-station, etc., will send a representative.

— Commodore Samuel R. Franklin, U.S.N., has been detached from duty on the naval examining board, and ordered as superintendent of the naval observatory, to succeed Rear-Admiral R. W. Shufeldt, who was placed upon the retired list on Feb. 21.

— At a concert given by the Choral club of the University of Wisconsin on the evening of Feb. 8, two songs by Sir William Herschel were sung, — the first, a glee, 'Go, gentle breezes;' the second, a catch,

'They say there is an echo here.' The manuscript copies of this music were loaned by the college library.

— The American ornithologists' union, with the enthusiasm of new institutions, has taken up the English sparrow question in an energetic and scientific way. A committee of the association has issued a circular asking answers to a series of twenty-eight questions. The value of the replies, especially to the later questions, will vary exceedingly; and we should judge it exceedingly difficult to assign them their proper relative value. Nevertheless, the general conclusion the committee will reach as to whether the bird is, on the whole, injurious or beneficial to agriculture, will not be likely to be disputed. The committee has divided the field among its members, Mr. Montague Chamberlain of St. John taking the British provinces; Mr. N. C. Brown of Portland, the three northern New-England states; Mr. H. A. Purdie, the other New-England states; Mr. E. P. Bicknell of New York, New York and the Western states; and the chairman, Dr. J. B. Holder of New York, the Southern and Middle states. The committee intends to construct a map of the present geographical distribution of the sparrow; and any volunteer information by those not reached by the circular will be gladly received by the chairman, who may be addressed at the American museum of natural history, New York. The authorities in Bermuda already offer bounties for the destruction of the sparrow, although heavy penalties are laid on the destruction of other birds on that lonely island.

— The sixth Saturday lecture of the Washington course was delivered on Feb. 9, in the lecture-room of the National museum, by Capt. C. E. Dutton, U. S. A., on 'The Hawaiian Islands and people.' Capt. Dutton visited the islands two years ago, in the interest of the Geological survey, to study the volcanic phenomena there for purposes of comparison with the region of extinct volcanoes in the western part of our own continent. His lecture was devoted in large part to a discussion of the geology of the Hawaiian group. An audience of about eight hundred was present. Mr. H. C. Burchard, director of the Mint, occupied the chair; and at the close a vote of thanks was moved by Major J. W. Powell.

— The Fish-commission steamer Albatross, now cruising in the Caribbean in behalf of the Hydrographic office, arrived at St. Thomas, Jan. 17, after a seven-days' voyage from Norfolk, and, after coaling, started on the 24th for Curaçoa, where she was due on the 14th of February. While at St. Thomas, the naturalists of the ship made considerable collections of birds and shallow-water invertebrates.

— Mr. F. W. True, curator of mammals in the National museum, is now at the British museum, studying the types of cetaceans, and especially of the Delphinidae, with the view of settling some important questions in the nomenclature and relations of the North-American forms. It is probable that his studies will demonstrate the identity of many of our Atlantic species, described as distinct by Agassiz, Cope, and others, with long-known European forms.

— At the November meeting of the Society of biblical archaeology, London, Mr. Budge of the British museum read a paper on the fourth tablet of the series of cuneiform texts relating to creation. Mr. Rassam has recently found a large Babylonian fragment of this fourth tablet. The language of the tablet is vigorous, and, like that of many of the cuneiform hymns, approaches in dignity the majestic roll of the Hebrew psalms. The deepest interest in connection with the tablet is the apparent acquaintance with rhyme and rhythm. Mr. Budge does not give enough of the original to aid us in testing this subject, but what he does give is favorable to the supposition. A peculiar kind of alliteration in the Babylonian cuneiform writing is already familiar. The fragment of a hymn on pp. 15 and 16 of Mr. T. G. Pinches' 'Texts in the Babylonian wedge-writing' is divided into stanzas of five lines each, and the same syllable begins each line of the stanza. There are five lines beginning with *ar*, five with *ba*, five with *su*, etc.

— The London papers are now discussing the desirability of opening the various museums of that city in the evening, for the benefit of that large class who have no command of their time during the day. The *Globe* is filled with letters on the subject. This discussion is called forth by the rumor that a bill will be presented in Parliament at the next term, for the opening of several of the more important art-galleries, museums, etc., after business-hours. South Kensington museum, and the Museum of practical geology, are now open from ten A.M. to ten P.M. on Saturdays, Mondays, and Tuesdays. There is no doubt but that these evening sessions are very useful, especially to that great and intelligent class of persons who do not belong to the group of 'workingmen' as that word is generally understood, but who, nevertheless, earn their living by work during the day, and have only the evening in which to gain information and widen their mental horizon. Many of our own cities would be greatly benefited if the museums and art-gallery could be opened in the evening.

— It has been the feeling for some time past in Germany, that that country should have a meteorological society. The want of this has been met by the publications of the Austrian society; but now that meteorology is making such rapid strides, and so many are becoming interested in it, there is much reason for the recent move made by the German meteorologists.

On Nov. 18, 1883, the following well-known contributors to our knowledge of this science met at Hamburg to ground a 'Deutsche meteorologische gesellschaft:' Assman, van Bebber, vo nBezold, Börgen, Börnstein, von Danckelman, Dinklage, Ebermayer, Hellmann, Honsell, Karsten, Klein, Koch, Köppen, Krebs, Müttrich, Neumayer, von Schroder, Schreiber, Sprung, Thilenius, Zöppritz. Many others sent letters expressing their intention to give aid to the project. The first general meeting of the society

will take place in September, 1884, at Magdeburg. Dr. Neumayer is president.

The aim of the society is to pay attention to the science of meteorology, as well as its relations to practical life. As a means of accomplishing this, 1°, meetings of the society and its branches will be established; 2°, a journal of meteorology will be issued; 3°, meteorological investigations will be aided, partly directly, and partly through its branches; 4°, lectures and other measures will be introduced for the distribution of meteorological knowledge in wider circles. The members are to be honorary, foundation, ordinary, and corresponding. The yearly assessment for ordinary members is ten marks ($2.50).

From private letters we are informed that the first number of the journal will be issued in a couple of months. It might seem at first as though this new journal would interfere with the work of that excellent journal, the *Oesterreichische zeitschrift für meteorologie*; but we believe that the editors of the journals will enter into such relations with each other that the two journals shall be supplementary the one to the other. It may be expected that this new journal will occupy as important a place as the Austrian, and therefore it ought to find its way into the hands of all those who wish to keep informed of the progress of this science. The *Deutsche seewarte* at Hamburg will naturally be the chief seat of work in connection with the issue of this journal. The treasurer of the society is Mr. Ernst Bopp, Königstrasse, No. 6 II, Hamburg.

— The M. P. club, a club of mathematicians and physicists living in Boston and vicinity, which meets once a month for the discussion of vexed questions in their departments, has issued the following list of subjects for discussion:—

1. Given a solid body in which the moments of inertia about four axes passing through one point are equal, does it follow that the moments of inertia about all axes, through the same point, are the same? 2. Are there any general methods for determining the form of a function when certain special values are known, or when certain conditions are given? For example: (*a*) To find $F(x, y, z)$, given $F(x, x, z) = 0$, and $F(x, y, z) = 1$. One solution is $F(x, y, z) = \frac{x - y}{z - y}$: what others are there? (*b*) $p = F\left(\frac{u}{v}, \frac{du}{dv}\right)$, $t = \dot{F}\left(\frac{u}{v}, \frac{du}{dv}\right)$: given $\frac{dp}{dv} + \frac{p - t}{v} = 0$, also given, that, when $\frac{u}{v}$ and $\frac{du}{dv}$ are interchanged, then p and t are interchanged, to find F and $\dot{F}$. 3. "Is it, therefore, an essential condition of equilibrium that $p(X\,dx + Y\,dy + Z\,dz)$ should be a perfect differential of some function?" (W. H. Besant's 'Hydromechanics,' p. 13.) "In this case of compressibility, $u\,dy - v\,dx$ is not the differential of any function; so that the function F does not exist, although, of course, stream lines exist" (Minchin's 'Kinematics,' p. 152). Such passages as these suggest the inquiry, "How are we to interpret physically the fact that a given differential is not an exact differential?" (see Clausius' 'Mechanische wärmetheorie,' p. 4.) 4. The graphical treatment of algebraic problems (see Vose's little book on the subject, published by Van Nostrand). 5. Graphical statics. 6. Anharmonic ratios; suggestions of new nomenclature. 7. Koenig's researches on beats and beat tones. 8. Euclid's doctrine of proportion. 9. Multiple algebra. 10. The comparison of Grassmann's theory of extension and Hamilton's quaternions. 11. Imaginaries in quaternions. 12. Weierstrasse's investigations in analytics and geometry. 13. The precise nature of the ancient problem of the quadrature of the circle. 14. The twelfth axiom of Euclid. 15. The bearing of the modern conception of non-Euclidean space on our theory of the foundation and certainty of geometric truth. 16. The true relation of hyper-space analytics to questions of actual existence. 17. Riemann's surfaces. 18. The meaning of an infinitely distant point on a straight line. 19. $\frac{1}{\infty}$ does not equal $a - a$. 20. Cayley's exposition of the logical structure of plane geometry ('Encycl. Brit.,' 9th ed.). 21. The synthetical (as opposed to analytical) character of all judgment and proof that is strictly mathematical. 22. The development of algebra from first principles as the science of pure time. 23. The calculus of logic. 24. The writings of François Viète. 25. Comparative merits of the method of limits and method of infinitesimals in elementary methods. 26. The same in the exposition of the higher calculus (with especial reference to Johnson and Rice's new 'Method of rates'). 27. Is gravitation a truth empirical, or *a priori*? and the limits of Newton's law of rate in gravity. 28. The principle of least resistance. 29. What exactly is meant by the correlation of forces, and what is its bearing on the conservation of energy? 30. The dissipation of energy. Its meaning and bearing on the stability of the universe. 31. Recent researches upon the atomic theory and upon the resolvability of the elements. 32. What constitutes the chief resistance in the case of a body moving through the water? 33. What is the form of least resistance for a row-boat? What for a sail-boat? What for a steamer? 34. Cause of capillary ascensions and depressions. 35. The means whereby water is able to penetrate capillary tubes against a superior pressure of a gas (see Daubrée's 'Études synthétiques de géologie expérimental,' Paris, 1879). 36. Microscopic action. 37. The diathermancy of ice from the point of view of James Croll's theory of glacial motion. 38. Direction of electric currents in diamagnetic bodies, e.g., bismuth. 39. Underground telephone circuits. 40. Elasticity and permanent set. 41. Diffraction gratings, plane and curved. 42. A short discussion (not too technical) on some of the instruments of research, such as the bolometer and the inductive balance. 43. Recent researches on the distance of the sun. 44. The origin of meteorites: are they volcanic ejections? 45. The aurora borealis, zodiacal light, etc. 46. If steam be enclosed in a cylinder open on the outside to the air, and compressed, is it possible to get a compression curve concave downwards (abscissae representing volumes, and ordinates pressures), and, if so, when?